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Final Environmental Impact Statement for the Rosemont Copper Project

A Proposed Mining Operation
Coronado National Forest
Pima County, Arizona

Volume 1



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Environmental Impact Statement for the Rosemont Copper Project

Coronado National Forest Pima County, Arizona

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Cooperating Agencies:	Bureau of Land Management, National Park Service, Saguaro National Park, Smithsonian Astrophysical Observatory – Fred Lawrence Whipple Observatory, U.S. Army Corps of Engineers, U.S. Department of the Air Force Davis-Monthan Air Force Base 162nd Fighter Airwing, Arizona Department of Environmental Quality, Arizona Department of Mines and Mineral Resources, Arizona Department of Transportation, Arizona Department of Water Resources, Arizona Game and Fish Department, Arizona Geological Survey, Arizona State Land Department, Arizona State Mine Inspector, Arizona State Parks, Pima County, City of Tucson, Town of Sahuarita
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Abstract: This final environmental impact statement (FEIS) documents the analysis of six alternatives (including a “no action” alternative) that was developed for the Rosemont Copper Project analysis. Alternative 4 – Barrel Alternative is the U.S. Forest Service preferred alternative. The Notice of Intent to prepare this document was published in the Federal Register on March 13, 2008. The public comment period was subsequently extended with a Notice of Intent that was published in the Federal Register on April 29, 2008. The draft environmental impact statement (DEIS) was released for public comment with a Notice of Availability (NOA) on October 19, 2011. The NOA was later revised to update meeting information and published on December 6, 2011. Subsequently, the comment period was extended with a Notice of Extension published in the Federal Register on January 27, 2012.

The Rosemont Copper Project proposes to mine copper and associated minerals on the Nogales Ranger District of the Coronado National Forest. The proposed activities include an amendment to the 1986 “Coronado National Forest Land and Resource Management Plan.”

Acronyms and Abbreviations

Documents

forest plan	“Coronado National Forest Land and Resource Management Plan,” as amended (U.S. Forest Service 1986)
preliminary MPO	preliminary mine plan of operations (WestLand Resources Inc. 2007)

Other abbreviations

°F	degrees Fahrenheit
ΔE	color difference index
AAC	Arizona Administrative Code
ACC	Arizona Corporation Commission
ADEQ	Arizona Department of Environmental Quality
ADOT	Arizona Department of Transportation
ADWR	Arizona Department of Water Resources
AGFD	Arizona Game and Fish Department
AGS	Arizona Geological Survey
ARS	Arizona Revised Statutes
ASLD	Arizona State Land Department
Augusta Resource	Augusta Resource Corporation
AUM	animal unit month
BLM	Bureau of Land Management
CAA	Clean Air Act
CAFÉ	corporate average fuel economy
CD	compact disc
CaCO ₃	calcium carbonate
CEC	Certificate of Environmental Compatibility
Census	U.S. Census
CEQ	Council on Environmental Quality

Acronyms and Abbreviations

CFR	Code of Federal Regulations
CH ₄	methane
CO	carbon monoxide
CO ₂	carbon dioxide
CWA	Clean Water Act
dB	decibel
dBA	A-weighted decibel
DEIS	draft environmental impact statement
EIS	environmental impact statement
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
FEIS	final environmental impact statement
Forest Service	U.S. Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
g	the acceleration due to gravity equaling 32 feet per second squared
GIS	geographic information system
GPS	global positioning system
HPTP	historic properties treatment plan
Hz	hertz
I-	interstate
ID team	interdisciplinary team
IMPLAN	Impact Analysis for Planning

kHz	kilohertz
kV	kilovolt
lb/mile	pound per mile
LED	light emitting diode
m^3/m^2	cubic meter(s) per square meter
mg/L	milligram(s) per liter
$\mu\text{g}/\text{m}^3$	microgram(s) per cubic meter
MOA	memorandum of agreement
MOU	memorandum of understanding
mpg	mile(s) per gallon
MPO	mine plan of operations
MSHA	Mine Safety and Health Administration
MW	megawatt(s)
NAAQS	national ambient air quality standards
NAGPRA	Native American Graves Protection and Repatriation Act
NEPA	National Environmental Policy Act
NFS	National Forest System
NFSR	National Forest System road
N_2O	nitrous oxide
NO_2	nitrogen dioxide
NO_x	nitrogen oxides
NRHP	National Register of Historic Places
O_3	ozone
Pb	lead
$\text{PM}_{2.5}$	particulate matter less than or equal to 2.5 microns in diameter

Acronyms and Abbreviations

PM ₁₀	particulate matter less than or equal to 10 microns in diameter
REMI	Regional Economic Models Incorporated
ROD	record of decision
Rosemont Copper	Rosemont Copper Company
Rosemont Copper Project EIS	Rosemont Copper Project Environmental Impact Statement
ROW	right-of-way
SHPO	State Historic Preservation Office
SO ₂	sulfur dioxide
SR	State Route
TCP	traditional cultural property
TEP	Tucson Electric Power Company
the Coronado	Coronado National Forest (the agency)
USACE	U.S. Army Corps of Engineers
U.S.C.	United States Code
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey
VOC	volatile organic compound
WUS	waters of the United States

Executive Summary

Introduction

Augusta Resource Corporation, the parent company of Rosemont Copper Company (Rosemont Copper), submitted a preliminary mine plan of operations (MPO) to the Coronado National Forest (the Coronado), an administrative unit of the U.S. Department of Agriculture Forest Service (Forest Service), for development of the Rosemont ore deposit. The proposed mine site is located on the east side of the Santa Rita Mountains of the Nogales Ranger District, approximately 30 miles south of Tucson, Arizona (figure ES1). Activity is proposed on approximately 995 acres of private land owned by Rosemont Copper, 3,670 acres of National Forest System (NFS) land, and 75 acres of Arizona State Land Department (ASLD) land administered as a State Trust. The mine life, including construction, operation, reclamation, and closure, is approximately 24.5 to 30 years and may include beneficial and adverse impacts on the human environment.¹

Two Federal agencies have authority regarding the preliminary MPO approval and permitting process: the Forest Service and U.S. Army Corps of Engineers (USACE). The Forest Service is the lead agency conducting the National Environmental Policy Act (NEPA) review of the MPO, and the Forest Supervisor of the Coronado is the responsible official for this environmental impact statement (EIS). There are 17 cooperating Federal, State, and local agencies with jurisdiction or special expertise related to aspects of the preliminary MPO, including the USACE.²

The preliminary MPO was concurrently submitted by Rosemont Copper to the Bureau of Land Management (BLM) for review and approval. This is because the MPO initially included an electrical transmission line, water pipeline, and access road that were proposed to cross BLM administered lands. On June 12, 2012, the Arizona Corporation Commission (ACC) selected an electrical transmission line route that does not cross land administered by the BLM, and Rosemont Copper subsequently withdrew the MPO from consideration by the BLM.

On October 19, 2011, a “Notice of Availability of Draft Environmental Impact Statement” for the Rosemont Copper Project DEIS was published in the Federal Register (76(202):64893–64894). The notice of availability began a 90-day public comment period. On January 19, 2012, with the publication of a notice in the Federal Register, the Forest Supervisor extended the formal comment period for the DEIS through January 31, 2012. This extension was necessary because a technical problem with the electronic mail inbox for public comments resulted in the rejection of some comments for a brief period of time on January 18, 2012.

The DEIS documented the Forest Service’s impact analysis for the construction, operation, reclamation, and closure of the proposed action (the MPO), four other action alternatives that would meet the purpose of and need for the project, and a no action alternative. The DEIS also disclosed the impacts of the project’s connected actions, which would only occur if the project was approved, as well as the cumulative effects the project would have when added to other past, present, and reasonably foreseeable actions. Based on the impact analysis disclosed in the DEIS, the responsible official identified the Barrel Alternative as the agency’s preferred alternative.

¹ The draft environmental impact statement (DEIS) gave the mine life as 20 to 25 years. However, this only refers to the operational mine life, and it has been corrected in the final environmental impact statement (FEIS). The stages of mine life are as follows: premining (18 to 24 months), active mining (20 to 25 years), final reclamation and closure activities (3 years), and postclosure (indefinite).

² The relationships between cooperating agencies and the Forest Service are governed by signed memoranda of understanding; these can be found in the project record.

Executive Summary

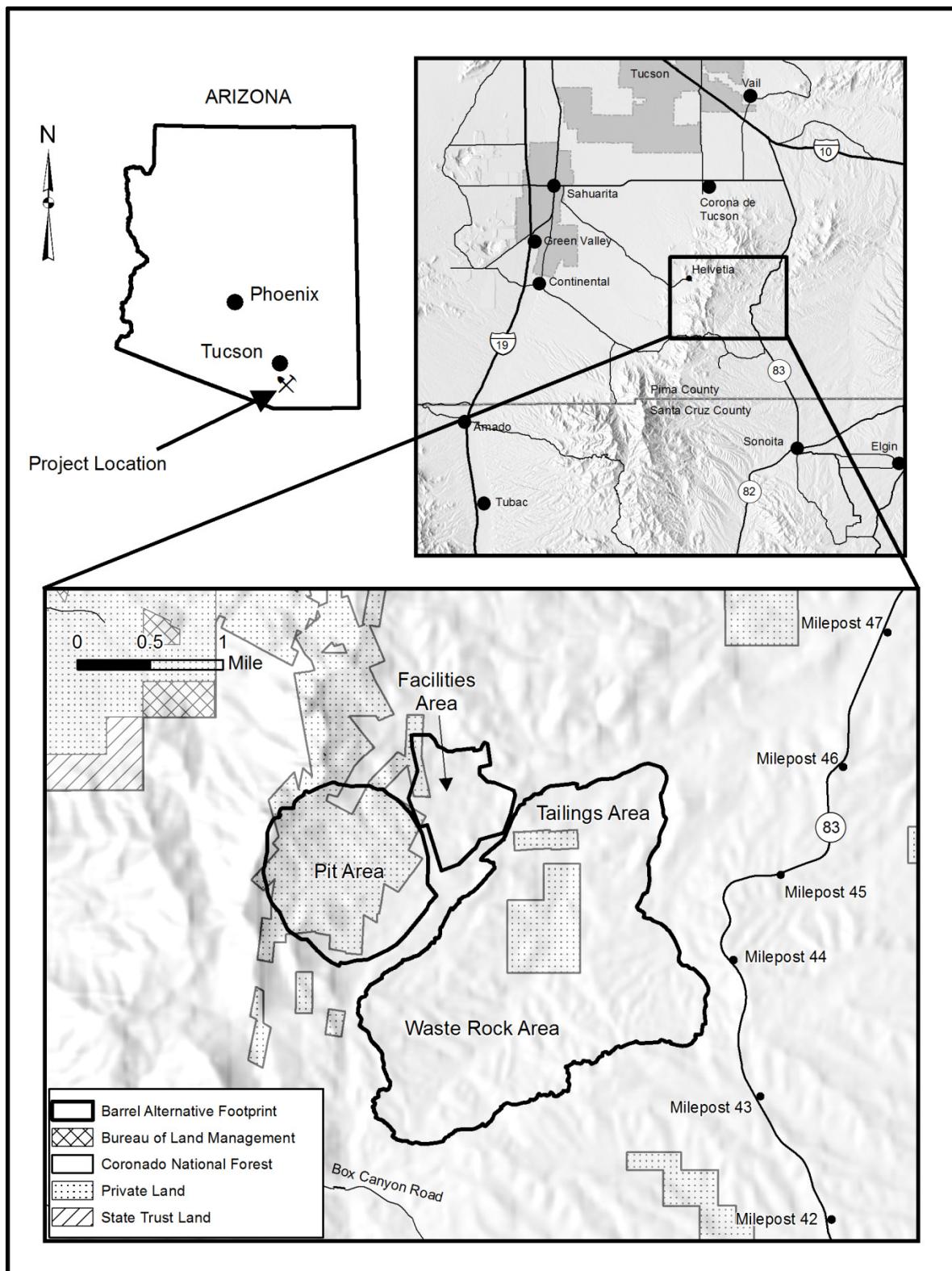


Figure ES1. Project area and preferred action footprint

During the public comment period for review of the DEIS, approximately 25,000 comment submissions on the DEIS containing more than 41,000 individual comments were received. The Forest Service analyzed all comments in order to identify issues that required further or updated analysis and identify analyses that required further clarification. Since the publication of the DEIS, the Forest Service has revised and clarified environmental impact analyses and conducted additional analyses based on public comments on the DEIS in the preparation of this FEIS. Appendix G contains a summary of Forest Service responses to comments received on the DEIS.

In addition to addressing public comments, this FEIS includes analysis of the most recent mine design updates. These mine design updates have been made by Rosemont Copper in order to address concerns on environmental issues and include updates to mine facilities and operations technologies and/or refinement of the mine's engineering plans and procedures. The description of the action alternatives in chapter 2 of the FEIS incorporates these updates. Lastly, details on mitigation measures have been further developed in order avoid, minimize, rectify, reduce, eliminate, or compensate for the impacts that the action alternatives would have on the environment. The complete list of mitigation measures and monitoring requirements is provided in appendix B of the FEIS, and their effectiveness is described in the appropriate resource sections in chapter 3.

Purpose of and Need for Action

The Coronado's overall purpose and need is to process Rosemont Copper's MPO. Rosemont Copper is entitled to conduct operations that are reasonably incidental to exploration and development of mineral deposits on its mining claims pursuant to applicable U.S. laws and regulations and is asserting its right under the General Mining Law to mine and remove the mineral deposit subject to regulatory laws.

From the perspective of the Forest Service, the need for action is to:

- Respond to Rosemont Copper's proposed MPO to develop and mine the Rosemont copper, molybdenum, and silver deposit;
- Ensure that the selected alternative would comply with other applicable Federal and State laws and regulations;
- Ensure that the selected alternative, where feasible, would minimize adverse environmental impacts on NFS surface resources; and
- Ensure that measures would be included that provide for reclamation of the surface disturbance.

The Coronado is evaluating the proposed action at this time in order to comply with its statutory obligations (see below) to respond to Rosemont Copper's preliminary MPO in a timely manner. The actions proposed in this FEIS describe the development of the Rosemont ore deposit owned and/or claimed by Rosemont Copper in a manner that: (1) complies with Federal, State, and local laws and regulations, (2) reduces adverse environmental impacts to NFS lands, and (3) is the least environmentally damaging practicable alternative in accordance with 40 Code of Federal Regulations (CFR) 230 as it pertains to Section 404 of the Clean Water Act (CWA). An initial evaluation of the preliminary MPO with regard to the elements of the "Coronado National Forest Land and Resource Management Plan" (forest plan), as amended (U.S. Forest Service 1986), indicates that certain aspects of the preliminary MPO are inconsistent with Coronado forest plan guidance. An amendment to the forest plan is proposed and included in this FEIS (see "Forest Plan Consistency" in chapter 2).

Issues

Using the comments received during the scoping process (see “Public Involvement” in chapter 1 of the FEIS) from tribes, agencies, organizations, and the public, the Forest Service developed significant issues to address in the DEIS. Significant issues are used to help formulate alternatives to the proposed action, develop elements or components of the alternatives, develop mitigation measures, and analyze environmental effects. A summary of significant issues for this project follows.

Issue 1: Impact on Land Stability and Soil Productivity

Ground disturbance from clearing vegetation, grading, and stockpiling soils has the potential to accelerate erosion and reduce soil productivity. The tailings and waste rock facilities could be unstable over time, and reclamation may not adequately result in a stable, revegetated landscape. The geochemical composition of tailings and waste rock facilities may not support native vegetation. Soils are nonrenewable resources. Damage, disturbance, and removal of the soil resource may result in a loss of soil productivity, physical structure, and ecological function across the proposed mine site and across downgradient lands. The mining area could potentially act as a barrier to sourcing and supporting natural downslope transportation of geological material, water, and nutrients through alluvial, eolian, and fluvial processes.

Issue 2: Impact on Air Quality

Changes in air quality that could potentially occur from the mine operation were identified as a significant issue. Construction, mining, and reclamation activities at the mine and along transportation and utility corridors would increase dust, airborne chemicals, and transportation related (mobile) emissions in the affected area. The Clean Air Act and other laws, regulations, policies, and plans set thresholds for air quality, including Class I airsheds.

The emission of greenhouse gases has been implicated in global climate change, and the policy of the Federal Government is to reduce these emissions when possible (Executive Order 13514). Greenhouse gases are those in the atmosphere that retain heat. They are natural and keep the earth from becoming too cold. The specific gases known as greenhouse gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorocarbons. CH_4 , N_2O , and fluorinated gases would be emitted by the project; however, the anticipated level of emissions of these gases is much smaller than the level of CO_2 emissions associated with the project.

Issue 3: Impact on Water Resources

This group of issues relates to the effects during premining, active mining, final reclamation and closure, and postmining phases on the quality and quantity of water for beneficial uses, wells, and stock watering. The loss of water available to riparian and other plant and animal habitat is addressed in Issues 4 and 5.

Issue 3A: East Side Groundwater Availability

The proposed open-pit mine may reduce groundwater availability to private and public wells in the vicinity of the open pit. Household water availability could potentially be reduced.

Issue 3B: West Side Groundwater Availability

Water needed to run the mine facility could reduce groundwater availability to private and public wells in the Santa Cruz Valley, specifically the communities of Sahuarita and Green Valley, Arizona. Household water availability could potentially be reduced.

Issue 3C: Groundwater Quality

Construction and operation of the mine pit, waste rock, and leach facilities have the potential to exceed Arizona Aquifer Water Quality Standards. The mine pit could result in the creation of a permanent pit lake, which has the potential to concentrate dissolved metals and toxins and may lower pH levels. Likewise, disposal of waste material in surface facilities such as tailings, waste rock, and leaching operations could potentially contribute to degradation of the aquifer.

Issue 3D: Surface Water Availability

Construction and operation of the mine pit, tailings, waste rock, and leach facilities have the potential to change surface water discharge to Davidson Canyon and Cienega Creek, portions of which are designated an Outstanding Arizona Water by the Arizona Department of Environmental Quality (ADEQ). Additionally, the availability of water for stock watering tanks could be reduced.

Issue 3E: Surface Water Quality

Construction and operation of tailings, waste rock, and leach facilities have the potential to result in sediment or other pollutants reaching surface water and degrading water quality, leading to a loss of beneficial uses. If sediment enters streams, turbidity will increase, and State water quality standards could be exceeded. Downstream segments of Davidson Canyon and Cienega Creek are Outstanding Arizona Waters (Tier 3), which are given the highest level of antidegradation protection. As outstanding resource waters under the Arizona Revised Statutes, Tier 3 waters must be maintained and protected, with no degradation in water quality allowed.

Issue 4: Impact on Springs, Seeps, and Riparian Vegetation

Potential impacts on seeps, springs, and associated riparian vegetation could result from the alteration of surface and subsurface hydrology because of the pit and other operations. Potential impacts could include reduced or eliminated flow to seeps and springs and loss of, or change in, the function of riparian areas.

Issue 5: Impact on Plants and Animals

This group of issues focuses on the effects on plant and animal populations and habitats. Many aspects of the mine operations have the potential to affect individuals, populations, and habitat for plants and animals, including special status species. This issue includes the potential for impacts on wildlife as a result of landscape alteration and as a result of light, noise, vibration, traffic, and other disturbance from the proposed mine operations.

Issue 5A: Vegetation

The pit, plant, tailings and waste rock facilities, road and utility corridors, and other facilities have the potential to permanently change vegetation, and reclamation may not restore vegetation to preproject conditions.

Issue 5B: Habitat Loss

The mine and ancillary facilities could result in a loss or alteration of habitat for numerous plant and animal species. Potential impacts could include loss of riparian habitat and fragmentation of riparian habitat and corridors, including Cienega Creek.

Issue 5C: Nonnative Species

The mine and its operations have the potential to create conditions conducive to the introduction, establishment, and/or spread of nonnative species, which may out-compete native plants and animals. Forest Service and other Federal, State, and local laws, regulations, policies, and plans contain management direction for invasive plants.

Issue 5D: Wildlife Movement

The mine and its operations could potentially modify and/or fragment wildlife habitats and/or reduce connectivity between habitats. Increased traffic could correspondingly increase wildlife mortality and injury.

Issue 5E: Special Status Species

The mine and its operations have the potential to impact habitat for special status species (see the “Analysis Methodology, Assumptions, Uncertain and Unknown Information” part of the “Biological Resources” section in chapter 3 for a description of special status species).

Issue 5F: Animal Behavior

Mine construction, closure, and operations, including drilling and blasting, may result in noise and vibrations, which could impact animal behavior and result in negative impacts on wildlife. Nocturnal and other animals may be adversely affected by the light glow in night skies.

Issue 6: Impact on Cultural Resources

This group of issues focuses on the adverse effects of the proposed mine operations on cultural resources. Mine operations could impact historic properties as well as traditional uses and perceptions of the land for the many communities who have used it over the past centuries. Native Americans claim the area as part of their ancestral homelands. Tribes consulted as part of the EIS process perceive disruption of the physical world as causing spiritual harm to the Earth and to the people here. Ancestral human remains and sacred sites are known to exist in the project area, as are traditional resource collecting areas.

Ranching and mining communities also have attachments to the area that began in the late 19th century and continue through the present. Comments submitted during public scoping identified impacts on the historic rural landscape as an issue, as well as impacts on traditional resource collecting areas and recreation venues. Historic human burials may yet be found in areas not excavated during previous archaeological investigations.

Issue 6A: Historic Properties

Proposed mine activities, from premining through final reclamation and closure, would bury, remove, or damage historic properties, including traditional cultural properties, sacred sites, traditional use

areas, archaeological sites, historical structures, districts, and landscapes. Vibrations from blasting and drilling could damage historical structures in the immediate and adjacent areas. This could also result in the loss of or reduction in the future research and public interpretation potential of known and yet-to-be-discovered sites, along with the permanent alteration of cultural landscapes important to the ongoing cultural practices of Native American tribes and other communities with cultural or historic ties to the project area.

Issue 6B: Disturbance of Human Remains

Human remains have been discovered in previous archaeological excavations of prehistoric and historical sites in the Rosemont area. Additional burials are present in previously excavated and unexcavated historic properties and may be present in as-yet-undetected historic properties. Proposed mine activities, from premining through final reclamation and closure, have the potential to disturb human remains. Native American remains on Federal lands fall under the jurisdiction of the Native American Graves Protection and Repatriation Act (25 United States Code 3001); nonnative remains on Federal lands fall under the Advisory Council's "Policy on Burial Sites, Human Remains and Funerary Objects on Federal Lands" (February 23, 2007). Arizona burial laws (Arizona Revised Statutes 41-844 and 41-865) protect human remains on State and private lands.

Issue 6C: Sacred Sites

Several Federal laws direct Federal land management agencies, to the extent permitted by law and not clearly inconsistent with essential agency functions, to accommodate access to and use of Native American sacred sites, to avoid affecting the physical integrity of such sites wherever possible, and to temporarily close NFS land for traditional and cultural purposes. Tribal consultation has identified springs, high vision points, and many natural resources in the project area as having sacred ceremonial functions. Proposed mine activities, from premining through final reclamation and closure, could preclude access to or destroy or degrade these types of resources.

Issue 6D: Traditional Resource Collecting Areas

Native Americans and the ranching, mining, and Mexican American communities use the Rosemont area to collect and process natural resources for food, medicines, firewood, and traditional crafts. Proposed mine activities, from premining through final reclamation and closure, could preclude access to or destroy or degrade these types of resources.

Issue 7: Impact on Visual Resources

This issue focuses on the visual impacts that would result from the proposed mine pit, placement of tailings and waste rock facilities, and development and use of other facilities. The proposed mine tailings and waste rock facilities would create significant changes to the landscape. The facilities may block valued mountain views. The processing plant, roads, and utility corridor could also affect visual resources in the area. The character of the State Route (SR) 83 designated scenic corridor and the views from it may change. The ability for the area to meet assigned scenic integrity objectives in the forest plan could potentially be reduced. The scenic quality of the landscape may be permanently degraded.

Issue 8: Impact on Dark Skies and Astronomy

This issue relates to the potential for the mine operation and facilities to reduce night sky visibility. Many area residents, recreationists, research and amateur astronomers, and stargazers value the current dark skies in the area. Increased light and air particulates from mine related facilities, equipment, vehicles, and processes have the potential to diminish dark skies. The increased sky glow could reduce the visibility of celestial objects, particularly the faint ones, which are often the subject of scientific study. Key observation points and the Smithsonian Institution's Fred Lawrence Whipple Observatory could be adversely affected.

Issue 9: Impact on Recreation

This issue focuses on the effects of the mine operation on recreation on NFS land, including loss of access and recreation opportunities and loss of or reduction in solitude, remoteness, rural setting, and quiet. The mine may lead to permanent changes to recreation settings (Recreation Opportunity Spectrum) and/or the type of recreation available and may result in increased pressure on public and private lands in other places to compensate for lost opportunities.

Issue 10: Impact on Public Health and Safety

This issue focuses on the hazardous materials that would be transported and the potential increase in the risk of a spill or other public safety impact. Furthermore, an increase in traffic could reduce public safety by increasing the potential for traffic accidents. Another aspect of this issue is human health risks to forest visitors if they inadvertently come into contact with mine operations, tailings facilities, or waste rock facilities. Air quality impacts resulting from the operation could potentially be harmful to public health.

Issue 11: Impacts on Social and Economic Resources

Mine operation could have both negative and positive socioeconomic impacts that could change over time. The socioeconomic stability of the area could be affected. Residents', business owners', and visitors' expectations of national forests and the historic rural landscape may not be met.

Issue 11A: Regional Socioeconomics

The mine facilities and operation may result in changes over time to local employment, property values, tax base, tourism revenue, and demand and cost for road maintenance and emergency services. There may be costs to the alternative elements and mitigation measures that influence the present net value of the mine operations and, thus, its economic profile.

Issue 11B: Rural Landscapes

The mine operation may not conform to the quality of life expectations as expressed by the forest plan and Federal, State, and local regulations and ordinances. Commenters expressed concerns about modification of rural historic landscapes and local ranching traditions, which are important to local residents and visitors. Commenters also expressed a need to assess impacts on quality of life, including the economic nature of these rural landscapes.

Issue 12: Impact on Transportation/Access

This issue focuses on the impact of increased mine related traffic during premining, active mining, and final reclamation and closure. Transportation of personnel, equipment, supplies, oversize permitted loads, and materials related to the mine operation has the potential to increase traffic. The operations also have the potential to permanently obliterate forest roads or temporarily restrict access to forest roads and lands.

Summary of the Proposed Action

The NEPA process begins with a proposed action, in this case the preliminary MPO submitted by Rosemont Copper. It should be noted that the proposed action is one of several alternatives considered in the FEIS. The proposed action should not be confused with the preferred alternative, which is the agency's current preference for implementation.

Rosemont Copper's preliminary MPO proposes construction, operation/reclamation, and closure of an open-pit mine to extract locatable minerals such as copper, molybdenum, and silver. The preliminary MPO also includes associated infrastructure and ancillary facilities. Associated infrastructure consists of haul, access and maintenance roads, ore transportation systems, ore processing facilities, waste rock and tailings facilities, leach facilities, electrical and water transmission lines, and ancillary facilities integral to the operations, such as the administration building, employee change house, warehouse, analytical laboratory, vehicle servicing facilities, storage facilities, guard house, and truck scale. At the end of mine life, the roughly circular open-pit mine would measure between 6,000 and 6,500 feet in diameter, with a final depth of 1,800 to 2,900 feet, depending on the elevation of the pit rim. The mine would produce a total of approximately 550 million tons of ore and 1,288 million tons of waste rock. The pit would disturb 955 acres, of which 590 acres would be private land and 365 acres would be NFS lands.

Primary highway access would be from SR 83, which connects to Interstate (I-) 10 approximately 12 miles north of the mine site. A new two-lane paved road would be constructed to provide primary access between SR 83 and the mine. At this intersection, SR 83 would be widened to include passing lanes. Public use would be restricted on portions of the primary access road during construction and operation of the mine owing to safety considerations but would be reopened to the public after closure as safety considerations allow. National Forest System Road (NFSR) 231 would be used to provide temporary access to the mine site while the primary access road is being constructed. The intersection of NFSR 231 and approximately 200 feet of this road would be reconstructed.

A gravel road would be constructed from the plant site to Lopez Pass to serve as a maintenance road for the utility supply lines. There are small portions of the new road construction that overlap existing NFSR 505, and those would be reconstructed as part of the utility maintenance road. However, most of the alignment would require new construction from the plant site to its western terminus. The rocky, hilly portion of the road would be reconstructed, and a new road would be created that would run west across private land. The road would intercept a major wash at its western terminus. There are no plans to construct a crossing of this wash, which would require an engineered structure. The second segment of the utility maintenance road would begin at the mine water supply wells near Sahuarita and follow the location of the electrical transmission and water lines. This road segment would cross land administered by the ASLD and private lands and would generally parallel Santa Rita Road.

Existing NFSRs within the perimeter fence not used for mining activities would be decommissioned. Decommissioning activities could range from closing and abandoning the road, to activities such as scarifying the road surface to discourage motorized use and promote vegetative recovery, to full topographic recontouring. NFSRs that are cut off by the perimeter fence would either be decommissioned, rerouted to connect to another area road, or have a turnaround area constructed exterior to the fenceline. New roads would be added as NFSRs, while decommissioned roads would be removed as NFSRs. This would include the construction of a new road from the primary access road to unauthorized road 4050-0.36R-1 in order to continue to provide legal public access to Sycamore Canyon. This new road is referred to as the “Sycamore Connector Road.”

The proposed mine contains two types of ore, sulfide and oxide. Oxide ore is located within the top portions of the excavated pit, which would be expected to be processed only within the first 6 to 7 years of the project. Oxide ore would be sent to a lined heap leach pad, where the ore would undergo a leaching process. The solvent extraction and electrowinning facility would recover copper from the leach solution using an extraction and stripping process that culminates in an electroplating process and would continually recirculate the process solutions. The heap leach pad and ponds would ultimately be encapsulated within the waste rock facility.

Sulfide ore would be sent through a circuit of crushers, grinding mills, and ball mills to reduce the rock size to the consistency of sand. A flotation circuit would separate the copper and molybdenum concentrates from the waste material. The concentrates would then be dewatered, thickened, filtered, and loaded for shipment. The waste or tailings from the sulfide ore processing would be dewatered using large-capacity pressure filters, which would essentially squeeze the water out of the tailings to create a dry cake with a moisture content of 12 to 18 percent, while 15 percent is optimum for placement. These dry-stack tailings would then be conveyed to the storage facility and placed in the dry-stack disposal, while the water would return to the process for recycled use and the concentrates would be shipped to market. No smelting would occur onsite.

Waste rock, which consists largely of chemically basic limestone and other largely nonacid-generating rocks, would be placed in areas located outside the proposed open pit. The dewatered tailings would be sent via conveyor belt to the unlined dry-stack tailings disposal area, where the tailings would be deposited, stacked, and compacted as needed. Both the waste rock and tailings facilities would be surrounded by a buttress constructed of waste rock, which would provide visual screening of the plant site and pit area, as well as containment and erosion control. The waste rock buttresses would be constructed early, which would allow reclamation of these outer slopes to take place concurrently with active mining. Ultimately, the tailings would be encapsulated, or covered, completely by a thick layer of waste rock.

The project would be located primarily within the Barrel Canyon drainage and its tributaries. Diversion channels would be constructed to intercept runoff from precipitation and route it around the mine facilities for discharge to lower Barrel Canyon, downstream of the project. Over time, the northern tailings facility would expand to the south and east and would cover a portion of the Barrel drainage. The diversion channel would then be extended in the natural drainage as a porous rock drain, known as the central drain, and waste rock would be stacked over the top of the rock drain material. A compliance point dam would be located in Barrel Canyon to provide the final stormwater discharge sampling location for the project. During operations, stormwater from the mine pit, ore processing facilities and tailings facilities, and mine maintenance plant areas would be collected in a process water control pond and recycled. Stormwater from the waste rock facility, including the waste

rock buttresses, would be routed to stormwater control ponds. The ponds would allow settling of sediment before excess stormwater flowed back to Barrel Canyon.

The project would use approximately 5,000 acre-feet per year of fresh water during operations. The water would be pumped from four to six wells located on land owned or leased by Rosemont Copper near the community of Sahuarita in the Santa Cruz Valley and would be piped to the mine. Construction of the proposed pipeline route would include four booster stations to maintain water flow. A much smaller amount of water would be obtained from stormwater from the mine pit and pit dewatering at the mine site. Most of the water used at the mine operation would be allocated to ore processing, with much smaller amounts employed for activities such as dust control, fire protection, drinking water, and sanitary uses.

The total power requirement for the project would be 108 to 112 megawatts (MW) and would require a minimum transmission voltage of 138 kilovolts (kV). Tucson Electric Power Company has entered into an agreement with Rosemont Copper to construct a transmission line to the proposed mine site. A Certificate of Environmental Compatibility from the ACC was issued for the power line on June 12, 2012. In addition to traditional electrical service from Tucson Electric Power Company, the project would also generate energy onsite using solar technology for ancillary facilities, such as to provide power for the administrative building.

Solid waste would be recycled as appropriate and feasible. Nonrecyclable, nonhazardous waste would be disposed of at a State-permitted onsite landfill, approximately 2 acres in size, located on Rosemont Copper's private property. Hazardous waste would be handled and disposed of in accordance with applicable regulations. No hazardous waste would be disposed of onsite. Sanitary waste at the project site would be handled by septic systems, with leach fields located in the vicinity of each building.

Blasting would be required prior to excavation of the ore and waste rock. Blasting operations would be conducted daily and would be limited to daylight hours. Blasting would typically occur once a day with an ammonium nitrate and fuel oil explosive. Dry bulk ammonium nitrate would be stored in silos south of the mine pit. Blasting detonators (caps, delays, cord, and boosters) would be stored in special magazines and transported in separate vehicles. All explosives management would be conducted in accordance with applicable rules, regulations, and safety standards.

Transportation of ore, waste rock, and tailings would occur only in the mine area, which would be closed to the public for safety reasons. Ore and waste rock would be moved in large, off-highway haul trucks. Roads for the haul trucks would be constructed both within the open pit and between the pit and the plant, heap leach, and waste rock facilities. Maximum truck speed would be 35 miles per hour. Haul roads are temporary and regularly move based on the locations of material placement. Haul roads would not be paved but would be routinely watered for dust suppression.

Mine related traffic on SR 83 during operations would primarily consist of trucks carrying supplies to the project, trucks carrying concentrate and copper cathodes from the project, and employee traffic. Truck shipments over the life of the mine are estimated at approximately 294 round trips per week, depending on the year. Copper and molybdenum concentrate shipments would form the largest number of routine truck shipments, with approximately 56 round trips per day, 7 days a week. The largest concentrated volume of mine traffic during a 24-hour period would occur during workforce shift change. Equipment and construction material deliveries to the site would be in addition to the large truck trip data provided. Major equipment arriving by rail may be received at the

Port of Tucson, which is located near Vail, Arizona, then hauled in highway-legal trucks to the mine site via I-10 and SR 83.

Preproduction stripping of overlying rock would require 18 to 24 months (premining stage) to prepare for full-scale mining operations, train work crews, construct access and haul roads, and clear and grub the pit and tailings and waste rock facilities that would be disturbed during the initial years of operation. Operation of the mine is proposed to occur over a 20- to 25-year period (active mining stage). It is anticipated that by year 10, leaching of the heap leach facility would be completed. At that time, the ponds would be decommissioned and residual leach solutions would have evaporated or been processed. Once the ponds are decommissioned and have been deemed closed or are under active management and in compliance with the aquifer protection permit issued by the ADEQ, the leach facility would be completely covered by waste rock.

Reclamation would be phased during the mine life, with concurrent reclamation occurring on the outer slopes of the perimeter buttress and waste rock facility as those surfaces are completed. Following completion of active mining (approximately 24.5 to 30 years after construction starts), further reclamation and closure would take place (final reclamation and closure stage). The open pit would be bermed and/or fenced to restrict access. Operating facilities at the project site would be demolished, including building foundations, which would be either buried in place or removed. All areas would be investigated for contaminants, and any contaminated soils, reagents, or fuels would be disposed of offsite at licensed facilities. Disturbed areas would be revegetated and monitored for reclamation success.

Project Alternatives

Alternative 1 – No Action

NEPA requires consideration of a “no action” alternative. Under this alternative, Rosemont Copper would not develop the Rosemont mineral deposit at this time. The environmental, social, and economic conditions described as the affected environment in chapter 3 of the FEIS would not be affected by the construction, operation, reclamation, or closure of the mine. Any existing exploration related or baseline collection disturbances on NFS lands by Rosemont Copper would be reclaimed in accordance with existing laws and permits. The no action alternative serves as the baseline against which to evaluate impacts of the proposed action and other action alternatives. Existing uses such as grazing and recreation would continue at current levels.

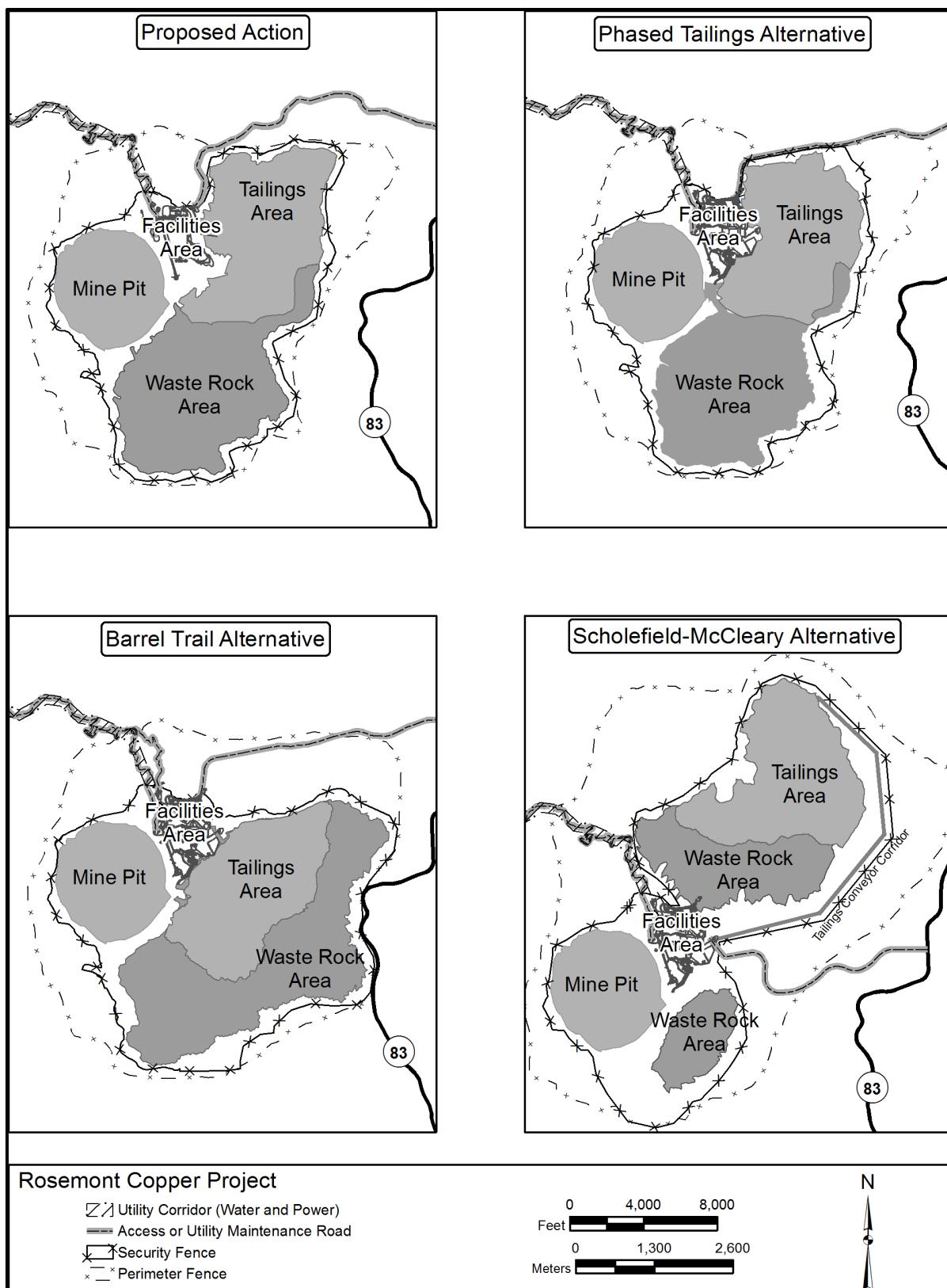
Alternative 2 – Proposed Action

Alternative 2 is the proposed action, which represents the MPO submitted by Rosemont Copper to the Forest Service. The proposed action was described in the previous section.

Alternative 3 – Phased Tailings

The majority of actions and facilities described for the proposed action apply to this alternative as well. The differences between alternative 3 and the proposed action are summarized below. The four alternatives to the proposed action are compared in figure ES2.

The Phased Tailings Alternative was developed to respond to the issues regarding the potential short-term impacts on water resources and visual resources. Alternative 3 phases in the placement of dry-stack tailings in McCleary Canyon, allowing it to remain open for approximately 10 years longer than

**Figure ES2. Action alternative footprints**

it would under the proposed action. Alternative 3 also modifies water controls, including removing the central drain and including additional underdrains, redesigns the process water control pond, modifies the topography of the slopes to appear undulating, realigns the primary access road, and relocates some plant facilities. Road decommissioning and construction of connector roads and turnarounds would be similar to the proposed action, although there are some differences, based on the location of the perimeter fence for the Phased Tailings Alternative.

Alternative 4 – Barrel Alternative (Preferred Alternative)

The Barrel Alternative was developed to respond to significant issues regarding potential impacts on biological resources, cultural resources, and the surface water component of water resources.

Since the release of the DEIS, there have been refinements to the Barrel Alternative in response to public comments and agency efforts toward geomorphic reclamation. Geomorphic reclamation involves the incorporation of postclosure landforms that replicate natural drainages, both functionally and visually. Through the refinement process for this alternative, Rosemont Copper committed to work within the project footprint developed by the Coronado interdisciplinary team. After further construction planning by Rosemont Copper, it became clear that this alternative could not be constructed according to the necessary phasing and still retain the heap leach facility with enough surface area to make the oxide ore processing economically feasible. In response to both public and other agency concerns about the heap leach facility and economic feasibility concerns, Rosemont Copper proposed to remove and the Forest Supervisor decided to remove oxide ore processing from the Barrel Alternative. Additional refinements to this alternative include the following:

- Inclusion of rock cover as part of reclamation on the east slope of tailings and waste rock facilities to promote long-term stability;
- Stormwater redesign, including removing the underdrains, eliminating storage on the top and benches of the tailings and waste rock facilities, and incorporating more stormwater routing downstream;
- Relocation of the Arizona National Scenic Trail to the east side of SR 83.

Road decommissioning and construction of connector roads and turnarounds would be similar to the proposed action, although there are some differences, based on the location of the perimeter fence for the Barrel Alternative.

Alternative 5 – Barrel Trail Alternative

The majority of actions and facilities described for the proposed action apply to this alternative as well. The differences between alternative 5 and the proposed action are summarized below.

The Barrel Trail Alternative was developed to respond to the issues regarding potential impacts on visual resources and the surface water component of water resources. Alternative 5 places all tailings and waste rock in upper Barrel, Trail, and Wasp Canyons. This alternative is similar to the Barrel Alternative in that it also permanently avoids placement of mine waste in McCleary Canyon. However, this alternative incorporates a more varied topography to more closely replicate a natural landform than the other action alternatives. The incorporation of a more varied topography necessitated a slightly expanded footprint of the tailings and waste rock facilities. The more varied topography of the Barrel Trail Alternative includes two ridges with varying elevations and an intervening valley that drains to Barrel Canyon. The primary and utility maintenance roads and the

general layout of facilities would be similar to the Phased Tailings Alternative, except that the tailings conveyor system would require modification to accommodate the relocated tailings facility.

Road decommissioning and construction of connector roads and turnarounds would be similar to the proposed action, although there are some differences, based on the location of the perimeter fence for the Barrel Trail Alternative.

Alternative 6 – Scholefield-McCleary Alternative

The majority of actions and facilities described for the proposed action apply to this alternative as well. The differences between alternative 6 and the proposed action are summarized below.

The Scholefield-McCleary Alternative was developed to respond to the issues regarding potential impacts on cultural resources, riparian habitat resources, and the surface water component of water resources arising from placing the tailings and waste rock in the McCleary and/or Barrel Canyon drainages. Alternative 6 would place all tailings and the majority of waste rock north of the McCleary Canyon drainage channel, with the dry-stack tailings occupying Scholefield Canyon and an unnamed tributary drainage and with waste rock placed on the northern slope of McCleary Canyon above the drainage bottom and extending to the north atop the tailings. General facility layout within the plant site would be similar to alternatives 3 and 4, except that the tailings dewatering facility would be moved to Rosemont Copper private land near Hidden Valley Ranch to accommodate the relocated dry-stack tailings facility. As a result of the relocation of mine waste to Scholefield Canyon, the primary access road would be constructed in a different location.

Road decommissioning would be similar to the proposed action, although it would occur to a greater degree due to the larger area within the perimeter fence for the Scholefield-McCleary Alternative. No new connector roads or turnarounds would be constructed with this alternative.

Connected Actions

The Council on Environmental Quality (CEQ) defines connected actions as actions that are closely related and that: (1) automatically trigger other actions that may require EISs; (2) cannot or will not proceed unless other actions are taken previously or simultaneously; or (3) are interdependent parts of a larger action and depend on the larger action for their justification (40 CFR 1508.25). The Coronado has determined that the following are connected actions that must be evaluated as part of this NEPA review. Additional details of these connected actions are provided in chapter 2.

Electrical Transmission Line

A 138-kV electrical transmission line and associated facilities would be constructed from the proposed Toro switchyard near Sahuarita to the Rosemont substation at the mine site. Because this decision is made by the ACC, the same transmission line alignment applies to every alternative.

Water Supply Pipeline

A water supply pipeline and ancillary facilities would be constructed to convey mine supply water from supply wells near Sahuarita to the mine site. This pipeline would be co-located with the electrical transmission line and buried where possible. Ancillary facilities include four pump stations and an electrical distribution line that would run from the Rosemont substation to the pump stations

on the same towers as the electrical transmission line. Because this supply pipeline was proposed to be co-located with the transmission line, the same alignment applies to all alternatives.

Electrical Distribution Line

An existing 46-kV electrical distribution line that currently provides electrical power to Rosemont Ranch and other private lands is located in an area where tailings and waste rock facilities would be constructed. Therefore, this distribution line would be relocated within the security fence where necessary. The portion of the distribution line that would require relocation varies by alternative, as described in chapter 2.

Arizona National Scenic Trail Reroute

The Las Colinas portion of the Arizona National Scenic Trail currently runs through the project area. Approximately 10 miles of existing trail would be relocated in order to accommodate both the Rosemont Copper Project and continued use of the trail. The portion of the trail to be relocated varies by alternative, as described in chapter 2.

State Route 83 Highway Maintenance and Improvements

The Arizona Department of Transportation (ADOT) has determined that a number of road maintenance and improvement actions would be required to mitigate increased traffic on SR 83 associated with the combination of mine activities and anticipated population growth. These actions include a 3-inch pavement overlay from the intersection of the primary access road to the junction with I-10; associated striping, raising of guardrails, and resigning; and paving of three existing pullouts to safely accommodate school buses. All actions on NFS lands would occur within the ADOT easement. Because these actions would be required by ADOT, they would apply equally to all alternatives.

A detailed summary of the proposed action, including connected actions, is presented in chapter 2, along with the other action alternatives considered in detail and the no action alternative. The documents that make up the complete preliminary MPO are filed in the project record.

Mitigation and Monitoring

Mitigation measures that are designed to avoid, minimize, rectify, reduce, eliminate, or compensate for impacts of the proposed action and other action alternatives have been proposed and included in the analysis of the FEIS. Many mitigation measures have been refined or added since the release of the DEIS. A table of specific mitigation and monitoring items is contained in appendix B. Details about the mitigation measures, including their effectiveness are further described in the appropriate resource sections in chapter 3. While implementation of most of mitigation measures specified in this FEIS would be required, Rosemont Copper has also proposed to implement a number of mitigation measures that are beyond the authority of the Forest Service or other regulatory permitting agencies. Refer to appendix B for further information.

Monitoring and evaluation activities would be prescribed, conducted, and/or reviewed by Rosemont Copper, the Coronado, and other regulatory agencies participating in a multiagency monitoring and evaluation task force. The Coronado Forest Supervisor plans to invite County, State, and Federal agencies with permitting or other regulatory authority to participate on this task force. The task force

would meet at least annually to review and evaluate monitoring results and make recommendations to the Forest Supervisor. Evaluation would indicate: (1) whether mitigation and monitoring requirements have been completed in accordance with the record of decision (ROD); (2) whether monitoring results indicate that the effects and results of mining and related activities are within the range of those predicted in the FEIS and ROD; (3) whether monitoring activities and methods remain valid and whether continued monitoring is warranted going forward; and (4) whether changed conditions, if any, dictate modification of the final MPO and/or ROD. Further information on monitoring requirements is provided in chapter 2 and appendix B of the FEIS.

Alternatives Considered but Eliminated from Detailed Study

A number of alternatives and alternative themes were considered but eliminated from detailed study, including mining other locations; alternate mining methods; modifying the life of the mine; change in scheduled hours of operation; suspending operations during high wind events; alternate water supply sources; transportation of workers, supplies, and shipments; use of a natural gas pipeline instead of an electrical transmission line; land exchange; downsizing the electrical transmission line; and burying the electrical transmission line. A more detailed discussion of these alternatives appears in the FEIS (see “Alternatives Considered but Eliminated from Detailed Study” in chapter 2), along with the rationale for dismissal.

Forest Plan Consistency

The Rosemont Copper Project was reviewed against the direction contained in the current “Coronado National Forest Land and Resource Management Plan” (forest plan), as amended (U.S. Forest Service 1986). The review determined that certain aspects of implementing the proposed action (preliminary MPO) or any of the action alternatives would result in conditions that are inconsistent with management direction in the forest plan.

Forest Plan Amendment

The Coronado proposes to amend its forest plan in order to address the inconsistencies of the proposed project with current standards and guidelines. The proposed forest plan amendment would create a new management area for which direction specific to copper mining would apply.

The proposed new management area would be designated “Management Area 16 – Rosemont Mining Area.” It would include standards and guidelines specifically developed to rectify conflicts between activities associated with copper mining and the existing forest plan, as amended. Further changes, if any, necessitated by the final decision would be addressed in the ROD. All mining and associated ground-disturbing activities associated with the Rosemont Copper Project would be located within the boundaries of proposed Management Area 16, with the exception of some access road construction, construction of the electric and water lines and associated maintenance road segments, and the movement of employees, materials, and mine products.

Summary of Impacts

Table ES1 compares the design elements for the action alternatives. The following text summarizes the direct and indirect impacts of each alternative based on the issues, as stated in chapter 1, that

drove the analysis. A more thorough and detailed discussion of impacts is provided in chapter 3 of the FEIS. Through this process, resource specialists determined some additional factors that should be considered in the overall analysis used to compare alternative effects.

Table ES1. Alternatives comparison table: disturbance elements

Disturbance Element	Proposed Action (preliminary MPO)	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Security fence disturbance area – all area within security fence	4,387	4,308	4,228	4,688	5,045
Primary access road corridor – 600 feet wide to allow for designed cut areas (outside security fence)	263	194	226	225	192
Utility line corridor – 500 feet wide for transmission with others co-located – water line and utility maintenance road – 150-foot corridor where not within transmission line, except for the designated 30- to 40-foot easement or ROW (outside security fence)	899	897	899	899	899
Road disturbance – outside security fence New Roads – 100 feet wide Decommissioned Roads – 14 feet wide	39 14	59 12	39 20	39 17	1 42
Arizona National Scenic Trail – 8 feet wide trail plus trailheads	11	11	19	19	19
Total Disturbance Area (acres)	5,612	5,481	5,431	5,888	6,197
Total Area Excluded from Public Access (acres) – within the Perimeter Fence	6,177	6,073	6,990	6,994	8,889

Alternative 1 – No Action

Under the no action alternative, the construction and operation of the project would not occur. The existing conditions within the project area would be maintained. Mineral resources would be available for future development.

There would be no impact on the existing air quality conditions within the airshed resulting from mine development. Existing and ongoing impacts to air quality from fugitive dust and vehicle emissions are expected to increase over time with continued population growth in southern Arizona. However, it is expected that monitoring and remedial actions by Pima County and ADEQ would be effective in keeping these gradual changes within regulatory limits.

There would be no impact to the existing soil conditions on public lands resulting from mine development, other than that involved with the reclamation of any existing exploration related or baseline collection disturbances. Impacts to soil resources from recreational use, livestock grazing, and fire activity would continue to occur. Levels of soil disturbance from these uses could increase as increasing population in southern Arizona results in additional recreational use of the area. Levels of livestock grazing on NFS lands are expected to be stable in the future, and additional soil disturbance

from this use is not expected to occur. Fire activity could increase with expected trends from climate change, potentially resulting in increased soil impacts.

Groundwater conditions in both the Upper Santa Cruz Subbasin and the Davidson Canyon/Cienega Basin will continue to change to reflect existing groundwater uses and increased future groundwater uses. Groundwater levels in the Upper Santa Cruz Subbasin will continue to decline because of existing groundwater withdrawals. In the Davidson Canyon/Cienega Basin, these withdrawals have the potential to impact springs, seeps, and perennial or intermittent streams such as Cienega Creek. These groundwater withdrawals will increase further with expected population increases in Pima County, although there is also the potential for alternative water sources to be used, such as Central Arizona Project water, to supply these demands. Land subsidence would likely continue to occur in the Sahuarita area at the current rate of 0.7 to 1.4 inches per year. Climate change will affect groundwater and surface water resources, as well. These changes will have effects on groundwater levels and on springs, seeps, and perennial or intermittent streams, particularly Cienega Creek, Empire Gulch, Davidson Canyon, and Gardner Canyon. Effects from climate change will exacerbate the stresses on these waters from increased groundwater use for domestic and stock purposes.

No impacts to groundwater quality beyond existing ambient concentrations would occur. Groundwater quality would continue to meet all existing numeric Arizona Aquifer Water Quality Standards, with the exception of arsenic. Over time, population is expected to increase in the area, increasing development and water use; however, these activities generally do not have the potential to affect groundwater quality.

Surface water within the project area will continue to consist solely of stock tanks or ephemeral flows that occur as the result of precipitation events. No further impacts to the quantity of surface water resources are expected. The use of surface water for recreation and/or stock watering would likely increase relative to the predicted increase in population growth and residential development. Climate change will continue over time. Anticipated decreases in winter precipitation would decrease the occurrence of ephemeral flows, and the anticipated increase in the frequency of heavy rains would create higher peak flows with a greater potential for flooding.

No further impacts to the quality of surface water resources would be expected. Grazing would continue in accordance with the approved forest plan and allotment management plans. Climate change would continue over time; anticipated decreases in winter precipitation could decrease the occurrence of ephemeral flows and thus the delivery of sediment downstream. Conversely, the anticipated increase in heavy rains would create higher peak flows with a greater capacity to carry sediment downstream. Population growth is expected to continue, and recreation within the area is expected to increase. This could result in greater ground disturbance and impacts to surface water quality.

Seeps, springs, and riparian areas within the analysis area would not be impacted by mine activities but would still likely undergo changes from current conditions, uses, and trends. The use of riparian areas for recreation would likely increase relative to the predicted increase in population growth and residential development. Use for stock watering could change, depending on changes in livestock management. Current trends show the impact that prolonged drought can have to spring and stream flow, and these changes could persist or worsen, exacerbated by climate change. Changes in vegetation type from hydroriparian or mesoriparian to xeroriparian, or from shallow-rooted phreatophytic vegetation like cottonwood/willow to deeper-rooted vegetation like tamarisk or mesquite could occur as conditions become drier.

There would be no impact to the existing biological resources on public lands resulting from mine development. Other impacts to biological resources from recreational use, livestock grazing, and fire activity would continue to occur within the project area. Levels of impacts to biological resources from these uses could increase as the growing population in the region results in additional recreational use in the area. Livestock grazing on the Coronado National Forest is expected to be stable in the future, and additional impacts to biological resources from this use are not expected to occur. Fire activity could increase with expected trends from climate change, possibly resulting in additional impacts to biological resources. Artificial night lighting of the Imerys quarry near the project area will also continue, which could continue to impact biological resources in the analysis area. Cumulatively, habitat degradation and species losses would continue to be pressured by trends in population growth and associated development, climate change, artificial night lighting, and associated changes to habitat.

Landownership and boundary management would not incur direct or indirect effects under the no action alternative. Private land in the form of patented mining claims and fee lands would remain, and management responsibilities of the Coronado, BLM, and ASLD would continue for NFS lands, public lands, and State lands, respectively.

There would be no loss of grazing access from any of the allotments and no loss of seeps, springs, or stock tanks. Site conditions would remain satisfactory. Climate change is expected to result in continued drought, which could stress vegetation and result in changes in grazing management in the future.

Impacts to dark skies from increased lighting at night would continue to increase as general population growth continues and development spreads, including night lighting of the Imerys quarry near the project area. Accordingly, negative impacts to the astronomy industry as a result of the increased lighting at night would be expected to continue.

Impacts to scenic quality would be minimal to nonexistent, as the landscape would remain consistent with existing views. Overall, continued development and use of public lands associated with increased population could continue to affect scenic quality over time. However, under the no action alternative, regional scenic quality would be generally preserved within the northern portion of the Santa Rita Ecosystem Management Area, as mining related activities would not be present.

Existing recreation uses would continue under current conditions. The settings, landscape, recreation sites, roads, and trails within the analysis area would continue to be affected by current conditions and ongoing actions. Routine maintenance of roads, the Arizona National Scenic Trail, and other facilities would continue. Access to public land in the area would continue, and traffic levels on area roads would likely increase as regional population growth occurs. Existing uses of the project area would continue and likely increase with population growth. Activities would include dispersed recreation use such as driving for pleasure, hunting, off-highway-vehicle use, camping, mountain biking, hiking, and horseback riding on the Arizona National Scenic Trail, bird watching, target shooting, firewood cutting, and other activities.

Under the no action alternative, the project area would remain in its present condition. The potential impacts from hazardous materials would not occur, and there would be no risk of a potential accident or spill involving hazardous materials from the proposed project activities. Transportation of hazardous materials along SR 83 would continue to occur for non-mine-related businesses and industries that currently use the highway for hazardous materials deliveries.

There would be no change to fuels and fire management conditions. Fires resulting from lightning would continue to occur at the same frequency. Human-caused fires from recreation and ranching activities could increase over time as the population continues to increase in southern Arizona and a corresponding increase in use of public land occurs. Continued fire suppression efforts and climate change will likely result in a continuation of the trends of increasing size and intensity and increased potential for high-intensity fires.

The existing transportation patterns and infrastructure in and around the project area would continue. General population growth in southern Arizona would contribute to increased traffic on all roads. It is anticipated that increased traffic resulting from population growth will result in conditions that remain within acceptable level of service, or ADOT will improve highway infrastructure to provide an acceptable level of service.

The no action alternative would result in noise levels similar to ambient noise levels. Population growth would lead to increased traffic on SR 83 and result in increased noise impacts to private properties adjacent to the highway. Population growth would also lead to an increase in demand for recreation activities on Forest Service lands such as off-road-vehicle use. An increase in recreation activities would result in increased noise impacts.

Under the no action alternative, the project area would remain in its present condition with respect to public health and safety. SR 83 and I-10 would continue to facilitate the transportation of hazardous materials to businesses and industries. Population growth in southern Arizona would continue to increase traffic on highways, which could subsequently affect transportation safety.

Direct and indirect impacts to cultural resources from the proposed project would not occur. There would likely be continued, if not expanded, use of the project area by tribal members and others to collect traditional resources. Increased recreational use often results in increased pressure on and damage to cultural resources, and the current monitoring may need to be increased to detect and deter vandalism, illegal excavation, and unauthorized collection. Some historic properties, human burials, and sacred sites in the project area could be impacted, either inadvertently or through illegal activities, but the scale of those impacts would likely be relatively small. Most archaeological investigations undertaken would be nondisturbing surveys, although some stabilization, restoration, or research may occur, in consultation with the State Historic Preservation Office (SHPO) and tribes.

Under the no action alternative, existing socioeconomic conditions and trends would continue. Current population trends are expected to result in a 14.4 percent increase in Cochise County, a 19.6 percent increase in Pima County, and a 26.7 percent increase in Santa Cruz County population by the year 2025. The projected increase in population in Cochise, Pima, and Santa Cruz Counties by the year 2025 would create an increase in housing demands. Changes in employment levels, income characteristics, spending activity, and taxes and revenues are expected to be consistent with current and projected economic trends. There would be no change to property values, other than fluctuations in value consistent with current and projected trends. Recreation and tourism activity is expected to increase with the projected population growth in the area. There would be no increase in light pollution or dust in the project area; thus, there would be no impacts to the astronomy industry or dark skies from the proposed mine. Increased development associated with the projected increase in population would result in more night lighting, but adherence to the Pima County Lighting Code is expected to keep these changes within acceptable levels. While there would be no impacts to quality of life from the proposed mine, as population increases in the region, the region will experience

additional pressures on its natural amenities and a slow degradation of its rural, undeveloped landscapes.

Under the no action alternative, adverse impacts to the potential environmental justice populations would not occur because the current land use would remain unchanged and opportunities for disproportionate adverse impacts would not exist.

Alternative 2 – Proposed Action

Geology, Minerals, and Paleontology

The mine operation would excavate and relocate approximately 1.83 billion tons of geological material, of which approximately 1.3 billion tons would be waste rock and 0.5 billion ton would be ore. Slippage or ground movement would be typically limited to the confines of the pit. The proposed action would disturb 2,876 acres that have a moderate to high potential fossil yield. A field survey for locating potential paleontological resources was conducted in 2011 for all action alternatives; no vertebrate fossils were identified. No cave resources have been identified in the project area. However, the potential may exist, and if present, cave resources could be impacted.

Upon indication or discovery of a cave or similar karst features, Rosemont Copper would suspend work at that site and contact the designated Forest Service representative to investigate the discovery before work is reinitiated. In order to mitigate potential impacts to significant paleontological resources, upon discovery of significant paleontological resources, Rosemont Copper would suspend work at that site and the site would be investigated by the appropriate personnel before work resumes.

Soils and Revegetation

The proposed action would result in the loss of 5,612 acres of soil productivity by direct impact of the mine footprint. Sediment delivery to the surface drainages would be about 16,000 tons annually, compared with 32,600 tons annually under current conditions. Tailings and waste rock facilities are modeled to have greater stability than required by regulation. Onsite test plots and greenhouse studies indicate that revegetation can produce a vegetation volume that is similar to historic climax conditions under proper management. Soil productivity would be recovered following placement of soil or soil/rock cover and revegetation, with the exception of 955 acres of mine pit.

The design of the proposed action and other action alternatives includes a mine footprint that is substantially smaller than conventional mines with similar production capacity. The use of dry-stack tailings facilities would also enhance reclamation, compared with the use of traditional tailings settling ponds. Filtered tailings would be transported, spread, and compacted to form an unsaturated, dense, stable tailings stack, which would include a surrounding rock and soil buttress seeded for revegetation. Revegetation efforts would be conducted to meet success criteria established by the Forest Service and would include the stockpiling and use of salvage topsoil as a growth medium. Revegetation efforts would establish native grasses, forbs, shrubs, and trees on areas disturbed by mining and mine related activities.

Air Quality and Climate Change

Under the proposed action, National Ambient Air Quality Standards (NAAQS) for most criteria pollutants during active mining would be met at the perimeter fenceline, with the exception of particulate matter less than or equal to 10 microns in diameter (PM_{10}). PM_{10} would exceed NAAQS at

the perimeter fenceline. Volatile organic compound (VOC) emissions would be about 86 tons per year during active mining and would represent less than a 1 percent increase in Pima County. Nitrogen oxide emissions would be about 1,200 tons per year during active mining and would represent a 3.4 percent increase in Pima County. Greenhouse gas emissions (CO_2) would represent an approximately 1 percent increase in Pima County. Emissions from the project may contribute to degradation of visibility and increase nitrogen deposition in the Saguaro Park East, Saguaro Park West, and Galiuro Wilderness Class I airsheds.

Rosemont Copper has committed to using numerous mitigation measures to minimize emissions and their impacts. These include: operational and engineering controls for controlling fugitive dust associated with the tailings; paving of the primary access road and other nonhaul roads within the mine site; use of water sprays and wet scrubbers associated with the ore crushing; use of covers to control emissions from mix tanks and settlers used in the solvent extraction system; use of spray or physical enclosures for low emission potential processes; inclusion of stockpile and loadout areas within the enclosed stockpile building; use of newer engine designs in mobile sources; dust control on access, haul, service, and maintenance roads; use of low-sulfur diesel fuel onsite for all stationary equipment; expedited construction of electrical lines to reduce the need for onsite power generation and associated emissions; design of the project administration building to incorporate sustainable energy concepts; and application of acid leaching solution to the heap using emitters (similar to drip irrigation) to avoid aerosol losses to the wind.

Groundwater Quantity

Upper Santa Cruz Subbasin: Under the proposed action, 4,700 to 5,400 acre-feet per year of groundwater would be pumped from the Upper Santa Cruz Subbasin of the Tucson Active Management Area and piped to the mine site in the Davidson Canyon/Cienega Basin. This would represent a 6.7 percent increase in groundwater pumping from the Upper Santa Cruz Subbasin and a 2 percent increase in groundwater pumping from the entire Tucson Active Management Area. Groundwater levels would decrease up to an additional 90 feet from the pumping, declining at a rate of 1.5 to 3.5 feet per year above and beyond existing groundwater declines. The geographic extent of the drawdown would be 3 to 4 miles from the Rosemont production wells during the first 20 years of pumping; the geographic extent of impacts would continue to expand an additional 1 to 2 miles for up to an estimated 140 years after completion of pumping. An estimated 500 to 550 registered wells are located within this area of drawdown; specific impacts to individual wells, if any, cannot be identified.

Rosemont Copper would mitigate the potential effects of mine related pumping on residential water supply wells in the Sahuarita Heights neighborhood by entering into an agreement with the United Sahuarita Well Owners. This well protection plan addresses pump inspection, pump maintenance, pump replacement, well inspection, well maintenance, and well replacement to ensure that residential water wells in the Sahuarita area that are enrolled in this program remain productive throughout the life of minerals production operations.

Rosemont Copper has committed to recharging available Central Arizona Project water to offset pumping. The location of the recharge may not be in the vicinity of the mine water supply wells, although Rosemont Copper has entered into an agreement with the Community Water Company for construction of a pipeline to the Sahuarita area that would allow for recharge near the pumping wells.

Davidson Canyon/Cienega Basin: The presence of the mine pit would create a permanent hydraulic sink in the vicinity of the mine site as a result of active pumping and long-term evaporation from the lake, which would result in permanent drawdown in water levels in the regional aquifer. Groundwater modeling shows that this drawdown would be greater than 100 feet in the immediate vicinity of the mine pit. Modeling also indicates that drawdown could occur up to 10 feet for residences in Singing Valley and at Hilton Ranch Road within 20 years of mine closure; drawdown over 5 feet would not be likely for Corona del Tucson residences, along Cienega Creek, along Gardner Canyon, or at the Davidson Canyon/Cienega Creek confluence. Drawdown of up to several feet could potentially occur along Empire Gulch beginning 50 years or more after mine closure. An estimated 360 to 370 registered wells are located within this area of drawdown; specific impacts to these wells, if any, are not known.

For the duration of the active mining phase, 13,000 to 18,500 total acre-feet of water would be lost as a result of dewatering the pit. Mountain-front recharge to the Davidson Canyon/Cienega Basin would be reduced by approximately 35-acre feet per year, and the water lost in perpetuity to evaporation from the mine pit lake after mine closure would be between 170 and 370 acre-feet per year (approximately 3 percent of basin recharge). Groundwater outflow from Davidson Canyon to Cienega Creek could potentially be reduced by a maximum of up to 12 percent.

Groundwater Quality and Geochemistry

Waste rock and tailings facilities: Under the proposed action, seepage is expected to occur from the dry-stack tailings facility from entrained process water. Infiltration of precipitation could cause seepage from the waste rock facility, but modeling indicates this is unlikely. Both of these sources could impact groundwater quality; however, modeling indicates that the water quality of potential seepage from these facilities would meet all Arizona Aquifer Water Quality Standards.

Heap leach: The heap leach facility is located and designed to collect all possible drainage and solution, is on top of a stable rock location, and would be encapsulated by waste rock to protect from stormwater infiltration. Following closure of the heap leach facility, seepage is expected to continue at low flow rates for up to 115 years. Modeling indicates that remnant heap leach seepage would exceed numeric aquifer water quality standards for cadmium, fluoride, and selenium. This seepage would be collected and treated prior to being discharged. Conceptual modeling shows that with treatment, heap leach discharge can meet all numeric aquifer water quality standards. Discharge from the heap leach facility has been permitted by the ADEQ under the Arizona Aquifer Protection Permit.

Pit lake: As modeled, mine pit lake water quality would potentially exceed the aquifer quality standard for thallium and ammonia and various surface water quality standards for cadmium, copper, lead, mercury, zinc, and selenium. However, neither the aquifer water quality standards nor surface water quality standards are applicable to the pit lake. The high concentrations of zinc and selenium are likely due to background groundwater quality.

Surface Water Quantity

Stormwater diversions would be designed and operated to route stormwater efficiently through or around project facilities and to transport runoff water to downstream watersheds. The proposed action would result in the direct loss of 11 stock tanks and indirectly impact up to 6 stock tanks downstream. Stormwater flow from the project area would be reduced by 46 percent, and flow in Davidson

Canyon would be reduced by 10 percent. A reduction in local aquifer recharge is possible but not quantifiable.

Surface Water Quality

Runoff would affect 2.5 miles of Barrel Canyon (23 acres) and 14 miles of Davidson Canyon (234 acres). The potential for impacts is greatest during active mine life and would gradually decrease as reclamation occurs. Sediment delivery downstream would be reduced from current conditions in Barrel Canyon and Davidson Canyon, but sediment concentration would be the same as current conditions. Runoff from waste rock is predicted to meet Arizona Surface Water Quality Standards for all constituents except dissolved silver; safety factors suggest that dissolved silver would likely be below standards as well. Current runoff does not meet Arizona Surface Water Quality Standards for total silver, arsenic, copper, lead, selenium, thallium, and dissolved copper. The proposed action would result in the direct loss of 42.5 acres of jurisdictional waters of the United States (WUS), regulated by the USACE, and the indirect loss of an additional 36.9 acres of jurisdictional WUS, for a total loss of jurisdictional WUS of 79.4 acres.

Mitigation measures under all action alternatives to reduce impacts to surface water quality include: the diversion of surface water from undisturbed areas of the watershed around mining activities; segregation and encapsulation of waste rock believed to have the potential for acid rock drainage by waste rock that has acid-buffering characteristics; testing of waste rock for acid rock drainage potential; use of lined ponds and retention of all stormwater flows in contact with ore bodies and other active mining facilities for reuse as process water; collection of stormwater from tailings and waste rock facilities in sediment ponds for further water quality testing prior to discharge to natural drainages; reuse or recycling of most process water; revegetation of tailings buttress walls to prevent erosion of sediment during mine operation; reclamation of mine facilities following mine closure; use of best management practices, stabilization measures, and sediment control measures; and proper management and storage of hazardous materials.

Mitigation measures for impact to WUS include those specifications identified in the CWA Section 404 individual permit and may include compensatory mitigation lands in Davidson Canyon and on Sonoita Creek, as well as transfer of water rights on Cienega Creek.

Seeps, Springs, and Riparian Areas

Under the proposed action and all action alternatives, groundwater drawdown and changes in surface water flow have the potential to impact riparian resources. Because of the long time frames and distances involved, projections of riparian resource impacts involve a high degree of uncertainty.

With the proposed action, a total of 7 springs would be directly lost as a result of surface disturbance, and 10 springs are highly likely to be indirectly impacted due to groundwater drawdown.

An additional 59 springs within the analysis area may be indirectly impacted due to groundwater drawdown; however, their water source is unknown and therefore difficult to predict.

A total of 19 springs within the analysis area is unlikely to be impacted by the proposed action.

According to geographic information system (GIS) analysis using Pima County Mapped Riparian Habitat data, approximately 686 acres of riparian habitat would be directly disturbed by the proposed action. Indirect impacts to riparian habitat would be expected as follows: 162 acres of xeroriparian habitat in Barrel Canyon with high certainty due to changes in surface water flow; 407 acres of hydroriparian habitat in Empire Gulch due to groundwater drawdown, but highly uncertain; 502 acres

of xeroriparian habitat due to changes in surface water flow in Davidson Canyon with moderate certainty. No widespread transition of hydroriparian habitat to xeroriparian habitat is expected to occur along Cienega Creek, Gardner Canyon, or lower Davidson Canyon. Predictions of whether perennial flow would change are mixed. Empire Gulch would likely eventually change from perennial flow status ephemeral flow status, although the timing of this change varies widely. Cienega Creek and Gardner Canyon would likely remain perennial at least 150 years after project closure; at 1,000 years after closure results are mixed, with some estimates indicating no change in perennial flow status, and some estimates suggesting changes to intermittent or ephemeral flow status. There is a high level of certainty that an additional 14 riparian areas associated with springs would be directly or indirectly disturbed; an additional 35 riparian areas associated with springs may be indirectly disturbed but with less certainty.

Changes to the function of riparian areas would be as follows: hydroriparian habitat along Empire Gulch could transition to mesoriparian or xeroriparian, although this is highly uncertain; pockets of mesoriparian habitat along Davidson Canyon (Reach 2) could transition to xeroriparian with moderate certainty; xeroriparian habitat in lower Barrel Canyon is highly certain to experience reduced vitality, extensiveness, and health and to transition to lesser quality habitat. Some contraction at the margins of the hydroriparian corridor could occur along Upper Cienega Creek. According to criteria assessed by the Coronado in order to predict impacts to Outstanding Arizona Waters, this designation for Davidson Canyon would not be affected by the proposed action, although analysis of antidegradation regulatory standards is difficult. This designation for Cienega Creek is unlikely to be affected for at least 150 years after closure; at 1,000 years, predictions are mixed but include the possibility of loss of stream flow and increased frequency and duration of low-flow conditions, which could affect water quality. All predictions of impacts to Cienega Creek have a high level of uncertainty.

Biological Resources

The proposed action would result in the direct, long-term or permanent impacts of 5,612 acres of terrestrial vegetation communities (which serve as habitat for plants and animals) because they would be cleared or buried under waste rock or tailings as a result of the construction of the mine facilities and connected actions. All action alternatives would result in increased air pollutants within the project area, which could impact biological resources. Additionally, the proposed action would result in impacts to biophysical features and groundwater and surface water (including seeps, springs, and stock tanks), which would result in direct and indirect, long-term or permanent impacts to biological resources. Finally, the proposed action would result in up to 146,163 acres of indirect, short- or long-term impacts to biological resources caused by decreased surface water flow, groundwater drawdown, noise, vibration, artificial night lighting, and increased traffic on SR 83 and other roads. The aforementioned impacts could impact animal behavior as a result of changes in habitat use, timing of activity patterns, inter- and intra-specific communication, foraging efficiency and success, reproductive success, and predator-prey relationships.

Some special status species could be directly and/or indirectly impacted, including 10 species federally listed as threatened or endangered under the Endangered Species Act (ESA) (Pima pineapple cactus, Huachuca water umbel, Chiricahua leopard frog, southwestern willow flycatcher, Mexican spotted owl, Gila chub, Gila topminnow, ocelot, lesser long-nosed bat, and jaguar), one species that is proposed for Federal listing as threatened under the ESA (northern Mexican gartersnake), and two species federally listed as candidate under the ESA (Sonoran desert tortoise and western yellow-billed cuckoo). For Forest Service and/or BLM sensitive species, the proposed action

may impact individuals of these species but is not likely to result in a downward trend toward Federal listing as threatened or endangered or in a loss of population viability of these species, with the exception of the Coleman's coral-root. The proposed action would eliminate a known population of Coleman's coral-root in McCleary Canyon as the result of the placement of dry-stack tailings over this population, and because this rare species (as currently known) has such a limited distribution globally (i.e., is restricted to a small area in southeastern Arizona), the proposed action could result in a downward trend toward Federal listing as threatened or endangered.

The proposed action is not likely to jeopardize the continued existence of any federally listed species and is not likely to destroy or adversely modify critical habitat for any federally listed species.

The proposed action would result in direct, long-term or permanent impacts to grassland, woodland, desertscrub, and riparian vegetation on Forest Service (and within the Santa Rita Mountains Important Bird Area) and private lands, potentially resulting in nest destruction for some species of migratory and resident birds. Golden eagles have been observed in the analysis area, and the proposed action would be expected to alter or remove foraging habitat for golden eagles. However, golden eagles are not known to nest in the project area; therefore, impacts to breeding golden eagles are not anticipated. Nesting, overwintering, foraging, roosting, and molt migration habitat for migratory and resident birds within the Santa Rita Mountains Important Bird Area could experience impacts from fugitive dust and air pollutants within the project area and could experience impacts from decreased surface water flow, groundwater drawdown, noise, vibration, artificial night lighting, and increased traffic on SR 83 and other roads in the analysis area, causing a decrease in food availability for some migratory bird species and resulting in a loss of nest sites and cover.

The proposed action would not be expected to result in forest-level impacts to any management indicator species for Coronado National Forest and hence populations of other species with similar habitat needs. Pima County covered species within the project area would be directly impacted by construction or operating activities, and covered species present in the analysis area could experience impacts from decreased surface water flow, groundwater drawdown, noise, vibration, artificial night lighting, and increased traffic on SR 83 and other roads associated with any of the action alternatives. The proposed action would increase movement habitat fragmentation and disrupt the dispersal and migration patterns of species using five animal movement corridors but would restore small amounts of three movement corridors due to decommissioning of roads. Further, animal mortality on SR 83 and other roads would likely increase for some species types but could decrease for other species types (depending on local wildlife populations and natural histories of species encountering roads) during mine construction and active mine operations.

When considered together, the reasonably foreseeable actions, combined with the expected impacts from the proposed action and with climate change and human population growth and associated development, would cumulatively contribute to impacts such as loss or fragmentation of habitat, vibration, noise, dust and air pollutants, artificial night lighting, and increased traffic on SR 83 and other roads. The overall result would be a continuation of the ongoing trend of reduced habitat quantity and quality; distribution of movement and genetic flow; and continued increase in risk and threats to sensitive species.

Proposed mitigation measures would help offset some effects in the project area; however, significant impacts would remain. Rosemont Copper has worked with other agencies (e.g., Pima County) to provide offsite mitigation to help offset some range-wide threats to some species. While these

measures would partially compensate for or offset impacts of the mine, they would not effectively offset all impacts, and significant impacts to habitat and some species would remain.

Landownership and Boundary Management

The direct effects of the action alternatives on landownership and boundary management are the destruction of the corner monuments used to delineate property boundaries. With completion of the dependent resurvey, all issues associated with damage or destruction to ownership boundaries and survey monuments have been resolved. Ownership boundaries and survey monuments can be relocated postclosure using the results of the dependent resurvey.

Livestock Grazing

The proposed action would result in a change from fully capable of supporting grazing activities to partially capable on 4,156 acres of the Rosemont grazing allotment, 204 acres of the Thurber allotment, 19 acres of the Greaterville allotment, 8 acres of the DeBaud allotment, less than 1 acre of the Helvetia allotment, and 0 acres of the Stone Springs allotment. The proposed action would result in a change from fully capable to not capable on 955 acres of the Rosemont grazing allotment (the area represented by the mine pit). A total reduction of 900 to 919 animal unit months (AUMs) would occur over the 25-year mine life. Eleven stock ponds and 76 springs would be impacted.

Dark Skies

Based on the original lighting plan for the proposed action, fractional increases in sky brightness at night would occur from mine facilities and vehicle lighting at the six viewpoints analyzed: Whipple Observatory, Jarnac Observatory, Sonoita, Corona de Tucson, segments of SR 83, and Empire Ranch. In general, the fractional increases in sky brightness at night would be the greatest at the horizon when looking toward the mine site from the viewpoints and would lessen as one looks up from the horizon toward the zenith (directly above). The increase in sky brightness would be most noticeable on SR 83 near the mine site. A total of 21,815,355 lumens would be expected to be generated by the mine facilities and vehicles under the original lighting plan. The revised lighting plan, which greatly reduces the amount of sky brightness created by the mine at night, was not included in the preliminary MPO and therefore would not apply to the proposed action.

Visual Resources

The proposed action would adversely impact visual resources. The proposed action would include strong contrasts and adverse impacts from the highly visible pit face and diversion channel, along with permanent and major impacts, including the irreversible loss of scenic views, from piles visible in Box Canyon, along the ridgeline, and at Lopez/Gunsight Pass for the life of the project.

Under the proposed action, the plant facility would be visible for up to 7 years. There would be impacts to 4,387 acres within the Santa Rita Ecosystem Management Area with very high and high scenic integrity characteristics. There would be 28.5 miles of project area visibility along forest roads and trails with concern levels 1 and 2, as defined under the Scenery Management System, and 3.4 miles of scenic quality impacts along SR 83. There would be 187,893 acres within the analysis area with project visibility.

Mitigation measures to reduce the impact to visual resources would occur during mine operations, closure, and postclosure. Concurrent reclamation would occur during operations and would have

minor beneficial effects on scenic quality. Sediment and dust controls would reduce but not eliminate visual impacts from fugitive dust. During operations, the colors of buildings would be painted or stained in earth tones to reduce color contrasts with the surrounding landscape. During closure, facilities that would not be needed for future management of the land would be removed. These facilities include buildings, the plant site, some roads, the perimeter and security fence (if not incorporated into allotment management plans), power supply line, and piping systems (consistent with Forest Service requirements, as well as requirements specified in the Certificate of Environmental Compatibility and ASLD right-of-way permit), and water supply pipeline. The plant site would be recontoured and revegetated with native vegetation. Building foundations would either be removed or broken up and buried. During closure, the applicability of measures to darken the exposed rock faces of the mine pit to reduce color contrasts would also be investigated. Breaking up the horizontal benches in the visible portions of the upper pit may also be pursued. Postclosure, reclamation would include monitoring revegetation success on the waste rock and tailings slopes.

Recreation and Wilderness

The proposed action, along with all action alternatives, would result in detrimental impacts to recreational opportunities available in and around the project area. Roads that are currently open for public motorized use on the Coronado National Forest would be closed and decommissioned. The public would be excluded from the area within the perimeter fence, resulting in a loss of recreation opportunities, including off-highway-vehicle use in this portion of the Santa Rita Backcountry Touring Area. Recreationists would likely be displaced to other areas. Recreational use could still occur outside the perimeter fence; however, the area near the fence may be less desirable for uses such as camping due to impacts from the mine, such as noise, visual impacts, and increased traffic. The proposed action would result in a loss of 6,177 acres of the Recreation Opportunity Spectrum based on the area within the perimeter fence, including these categories: 0 acres of semiprimitive nonmotorized, 5,942 acres of semiprimitive motorized, 170 acres of roaded modified, and 65 acres of roaded natural. No hunting permits would be modified or lost, but 4 percent of hunt unit 34A would be affected, resulting in 775 annual hunter days lost for certain species (white-tailed deer, javelina, and Mearn's quail). A total of 17.5 miles of NFSRs would be lost, and 7.3 miles of the Arizona National Scenic Trail would be relocated. For the proposed action and Phased Tailings Alternative, a segment of the Arizona National Scenic Trail would be rerouted to a location between the perimeter fence and SR 83. The view and overall user experience on this section of the trail would be dominated by the large industrial mine that would be adjacent to the trail.

Hazardous Materials

This section refers to the risk of release to and effect of hazardous materials on the environment (as opposed to risks to public health and safety). Under the proposed action, the use of ammonium nitrate and fuel oil mixtures, laboratory reagents, cleaning fluids, and solvent extraction and electrowinning reagents (excluding sulfuric acid and kerosene) represent a negligible risk to the environment. The proper storage of ammonium nitrate in dry form in silos presents little risk to the environment. The proper storage, disposal, and transportation of hazardous waste present little risk to the environment.

An accidental catastrophic release of sulfuric acid or petroleum products during transportation would cause direct impacts to plants, wildlife, and soil in the immediate vicinity of the spill; could possibly migrate into surface waters and cause indirect downstream effects on vegetation, aquatic species, and wildlife; and would pose some risk of groundwater contamination.

An accidental catastrophic or major onsite release of sulfuric acid or petroleum product would cause direct impacts to soil and wildlife, and if a long-term release were to occur, it would carry a high potential for groundwater contamination. Groundwater contamination would be unlikely to migrate beyond the mine site because of hydrologic gradients but would cause direct impacts to birds and wildlife from contamination of water in the pit.

If the leach pad containment were to fail, it would cause direct impacts to groundwater from sulfuric acid. Groundwater contamination would be unlikely to migrate beyond the mine site because of hydrologic gradients but could cause direct impacts to birds and wildlife from contamination of water in the pit.

The risk of accidental releases of hazardous materials cannot be entirely prevented, but proper training, storage, and handling are intended to minimize the potential for releases, and in the event of a release, to minimize the effects on and threat to the environment.

Fuels and Fire Management

The proposed action would cause an increased risk of ignition of wildfires along transportation routes, an increased risk of wildfire spread from the transportation of flammable materials, and minor additional fuel loading from noxious weed growth. Noxious weed management would help mitigate overall potential for a fire to occur, and training, fire control plans, and a greater availability of water sources for firefighting purposes would help reduce the severity and extent of fires.

Transportation/Access

The proposed action would increase truck traffic and passenger car traffic on potential routes to the mine. The proposed action would also increase truck traffic on potential delivery routes that mine products (i.e., copper concentrate and copper cathodes) could take to reach their destinations (i.e., Port of Tucson or ports of entry to reach smelters in Mexico). Year 1 of the active mining phase would have the highest level of mining related traffic. During this year, up to 284 worker commutes, 28 materials/equipment shipments, 56 copper concentrate, and 4 copper cathode deliveries per day would occur. The anticipated increase in traffic resulting from population growth, combined with mine related traffic during all mine phases, would decrease the level of service for some intersections and roadway segments but would not decrease the level of service to unacceptable levels (level D or lower). An increase in traffic due to population growth and mine related traffic would increase the potential for traffic accidents, including accidents with fatalities, to occur on SR 83. It is important to understand that traffic accidents and fatalities are the result of numerous variables that cannot be predicted with any certainty.

Approximately 33 miles of existing NFS roads would be decommissioned by the mine, with an additional 17.5 miles restricted by mine operations. After mine closure, public access would be restored to the primary access road and those portions of the utility maintenance road over which the Coronado and/or public has legal public access.

Noise

The proposed action would result in impacts to recreational users from intermittent blasting noise (premining and active mining phases) and equipment operational noise (active mining phase), resulting in a likely decrease in recreational value in the area during premining and active mining phases. The proposed action would not result in impacts to nearby residents from construction,

blasting, equipment operation, or traffic noise during any phases of mine life. Noise caused by an increase in traffic would impact private property along SR 83.

Public Health and Safety

Risks to public health and safety would exist from the storage, use, and transportation of hazardous materials. While unlikely to occur, an onsite ammonium nitrate explosion could cause damage up to 2 miles away and release a plume of toxic gases. If a sulfuric acid release is exposed to fire or reactive materials, a plume of smoke and/or toxic gases would be produced. An accident during transportation involving sulfuric acid, fuels, or ammonium nitrate could affect a radius of up to 0.5 mile, and an accident during transportation of explosives could affect a radius of up to 1 mile. Existing groundwater withdrawals contribute to land subsidence in the Santa Cruz Valley; an incremental additional risk of subsidence would result from mine water supply pumping. The proposed action would not meet NAAQS for human health (PM_{10}) at the perimeter fence. The proposed action would increase traffic on SR 83 from worker commutes and truck traffic, including hazardous materials deliveries. Therefore, a corresponding increase in the potential for traffic accidents could be anticipated, including increased potential for hazardous materials spills on public roadways.

Risks to public health and safety from recreation hazards, noise, or air quality would be unlikely to occur.

Cultural Resources

The proposed action, including the utility corridor, would impact a total of 85 historic properties, including 31 prehistoric sites known or likely to have human remains and 3 historic sites likely to have human remains. A total of 17 sacred springs/seeps is highly likely to be impacted; springs are considered sacred by all of the tribes consulted by the Coronado. The proposed action would impact 6,177 acres of traditional resource collection areas.

Mitigation of adverse effects on archaeological sites has traditionally involved data recovery excavations that sample or completely excavate a site to document the information contained therein and to identify human remains and arrange for their repatriation to culturally affiliated individuals or tribes. Excavation, however, destroys the site and is constrained by the analytical technology available at the time of the excavation. Any future information potential of the sites would be destroyed as well.

The sanctity and power of each spring are also unique and cannot be replaced once the spring is destroyed.

The Tohono O'odham Nation requested, and the Coronado recommended, eligibility of the Santa Rita Mountains as the *Ce:wi Duag* Traditional Cultural Property for listing in the National Register of Historic Places. SHPO has confirmed eligibility of these properties as traditional cultural properties. All of the action alternatives and portions of the utility corridor are within the proposed boundary of this traditional cultural property. The cultural landscape would be irrevocably altered by the movement of rock and soil and transformation of the topography associated with the proposed project.

Socioeconomics and Environmental Justice

Changes in employment over time would vary, depending on the mine phase. During the premining phase, the proposed action would require up to 594 direct jobs and 443 indirect jobs per year in Pima County. In the 3-county analysis area, 768 direct jobs and 453 indirect jobs would be required per year. During the active mining and reclamation/closure phases, up to 434 direct jobs and 1,260 indirect jobs per year would be required in Pima County, and up to 434 direct jobs and 512 indirect jobs per year would be required for the 3-county analysis area.

Within 5 miles of the project area, the proposed action could potentially decrease property values by between 4 and 11 percent. Potential impacts could include more than a \$6.4 million reduction in property values.

The proposed action would increase the regional tax base. During the premining phase, the construction sales tax would generate up to \$11 million. The total direct local and State tax revenues over the life of the mine are estimated at \$136.7 million.

The proposed action would increase the demand and cost for road maintenance on State highways. The cost to repair roads that are used by mine traffic would be partially offset by increased tax revenue from more fuel consumption. The cost to repair SR 83 would also be partially offset by Rosemont Copper's funding a 3-inch overlay of the highway from its intersection with I-10 to the proposed primary access road prior to the active mining phase. The anticipated increase in traffic could also lead to an increase in demand for emergency services.

With respect to changes in tourism, the proposed action would be expected to directly decrease nature-based visitor spending by \$1.1 million to \$3.8 million per year. An estimated 15 to 50 percent decrease in nature-based tourism between 0 and 10 miles from the proposed mine would occur. Indirect effects in the greater Tucson area are expected to include an estimated \$511,000 to \$1.7 million reduction in output per year.

The proposed action would be expected to have an adverse impact to dark skies that could result in an impairment of activities at observatories near the project area. This could result in a decrease in State revenues generated from astronomy, space, and planetary research and associated tourism. The negative public perception of having a copper mine close to an observatory may impact the observatory's ability to compete for revenues from other observatories around the world.

The proposed action would have the potential to degrade quality of life expectations for a rural landscape as a result of the mine's altering the existing landscape. Santa Cruz County could experience a 0.08 percent of county population decrease in net migration as a result of the proposed action. The Patagonia Census County Division could experience a 6 to 33 percent decrease in population growth rate. These decreases in amenity-based migration may be offset by an increase in mine staff relocations to these areas. Impacts to amenity migration in Pima County and the greater Tucson metropolitan area are expected to be negligible due to the more dynamic nature of the metropolitan economy.

Regarding Title VI of the Civil Rights Act, the proposed action would have possible disproportionate effects on the Tohono O'odham Nation, as well as other consulting tribes, due to direct impacts of cultural resources.

Alternative 3 – Phased Tailings Alternative

Impacts to these resources would be the same as under the proposed action alternative: air quality and climate change, fuels and fire management, groundwater quality, landownership and boundary management, hazardous materials, noise, public health and safety, and transportation/access.

Geology, Minerals, and Paleontology

Impacts to geology and minerals would be the same as under the proposed action. The Phased Tailings Alternative would disturb 2,904 acres that have moderate potential fossil yield. The mine operation would excavate and relocate approximately 1.78 billion tons of geological material, of which approximately 1.2 billion tons would be waste rock and 0.5 billion ton would be ore.

Soils and Revegetation

Impacts from the Phased Tailings Alternative to soils and revegetation would be the same as under the proposed action, except that the Phased Tailings Alternative would result in the loss of 5,481 acres of soil productivity by direct impact of the mine footprint (compared with 5,612 under the proposed action), and sediment delivery to the surface drainages would be about 16,500 tons annually (compared with 16,000 tons annually under the proposed action).

Groundwater Quantity

Under the Phased Tailings Alternative, impacts to groundwater quantity would be identical to the proposed action, with one exception: groundwater outflow from Davidson Canyon to Cienega Creek would potentially be reduced by a maximum of 11.3 percent (compared with 11.7 percent under the proposed action).

Surface Water Quantity

Impacts from the Phased Tailings Alternative to surface water quantity would be the same as under the proposed action, with the exception that the Phased Tailings Alternative would result in a 44 percent reduction in stormwater flow from the project area (compared with 46 percent under the proposed action), and flow in Davidson Canyon would be reduced by 11 percent (compared with 10 percent under the proposed action). All other impacts to surface water quantity would be the same as identified under the proposed action.

Surface Water Quality

Impacts from the Phased Tailings Alternative to surface water quality would be the same as under the proposed action, with the exception that the Phased Tailings Alternative would result in the direct loss of 41.8 acres of jurisdictional WUS (compared with 42.5 acres under the proposed action), and the indirect loss of 37.2 acres of jurisdictional WUS (compared with 36.9 acres under the proposed action), for a total loss of jurisdictional WUS of 79 acres.

Seeps, Springs, and Riparian Areas

Impacts from the Phased Tailings Alternative to seeps, springs, and riparian areas would be the same as under the proposed action, except that the Barrel Alternative would impact 649 acres of Pima County Mapped Riparian Habitat (compared with 686 acres under the proposed action).

Biological Resources

The Phased Tailings Alternative would result in the direct, long-term or permanent impacts on 5,481 acres of terrestrial vegetation communities (which serve as habitat for plants and animals) because they would be cleared or buried under waste rock or tailings as a result of the construction of the mine facilities and connected actions. Impacts to biological resources would be similar to the proposed action, with the exception of one population of Coleman's coral-root that would not be directly impacted by the waste rock and tailings facilities and would be fenced off. Direct and indirect impacts to these species would be equivalent to the impacts of the proposed action. Five animal movement corridors would be disrupted, and small amounts of three movement corridors would be restored due to decommissioning of roads. Compared with the proposed action, the Phased Tailings Alternative would delay impacting McCleary Canyon by 10 years.

Livestock Grazing

Impacts from the Phased Tailings Alternative to livestock grazing would be the same as under the proposed action, with the following exceptions: a change from fully capable of supporting grazing activities to partially capable on 4,085 acres of the Rosemont grazing allotment, and the DeBaud allotment would not be impacted.

Visual Resources

The Phased Tailings Alternative would adversely impact visual resources in a manner similar to the proposed action. However, the open pit would be more visible in early years and slightly less visible permanently, and the increased visibility of the piles would cause adverse impacts. The facility would be visible for up to 12 years. There would be impacts to 4,308 acres within the Santa Rita Ecosystem Management Area with very high and high scenic integrity characteristics (compared with 4,387 acres under the proposed action). There would be 29.3 miles of project area visibility along forest roads and trails with concern levels 1 and 2 (compared with 28.5 miles under the proposed action) and 3.5 miles of scenic quality impacts along SR 83. There would be 245,038 acres within the analysis area with project visibility.

Mitigation measures to reduce the impact to visual resources would be similar to those for the proposed action.

Recreation and Wilderness

Impacts from the Phased Tailings Alternative to recreation and wilderness would be the same as under the proposed action, with the following exception: impacts to 6,073 acres of the Recreation Opportunity Spectrum, including 5,838 acres of the semiprimitive motorized category.

Dark Skies

Based on a revised lighting plan that applies to the Phased Tailings, Barrel, Barrel Trail, and Scholefield-McCleary Alternatives, fractional increases in sky brightness at night due to mine facilities and vehicle lighting were analyzed at six viewpoints: Whipple Observatory, Jarnac Observatory, Sonoita, Corona de Tucson, segments of SR 83, and Empire Ranch. Compared with the original lighting plan for the proposed action, the revised lighting plan substantially reduces the amount of lumens that the mine facility would be anticipated to create. A total of 6,529,184 lumens (6,423,646 predicted from the lighting mitigation plan for the Barrel Alternative, plus an additional

105,538 lumens associated with the heap leach facility) would be expected to be generated by the mine facilities and vehicles under the revised lighting plan, compared with 21,815,355 lumens that would be generated under the original lighting plan. The revised lighting plan constitutes a 70 percent decrease in total lumens from the original lighting plan.

Cultural Resources

The Phased Tailings Alternative, including the utility corridor, would impact 83 historic properties, consisting of 30 prehistoric sites known or likely to have human remains. The Phased Tailings Alternative would impact 6,073 acres of traditional resource collection areas.

Otherwise, impacts from the Phased Tailings Alternative would be identical to the proposed action.

Socioeconomics and Environmental Justice

Changes in employment over time; changes in property value; changes in tax base per year over time; change in the demand and cost for road maintenance on State highways; change in demand and cost for emergency services over time; economic effects on the astronomy industry; the ability to meet quality of life expectations for a rural landscapes; economic effects on amenity based relocation; and impacts to populations protected by Title VI of the Civil Rights Act would be the same as with the proposed action.

With respect to changes in tourism, the Phased Tailings Alternative would be expected to directly decrease nature-based visitor spending by \$1.0 million to \$3.6 million per year. An estimated 15 to 50 percent decrease in nature-based tourism between 0 and 10 miles from the proposed mine would occur. Indirect effects in the greater Tucson area are expected to include an estimated \$472,600 to \$1.6 million reduction in output per year.

Alternative 4 – Barrel Alternative

Impacts to these resources would be the same as under the proposed action alternative: fuels and fire management, groundwater quality, landownership and boundary management, and noise.

Geology, Minerals, and Paleontology

Impacts to geology and minerals and the potential for subsidence would be the same as under the proposed action. The Barrel Alternative would disturb 3,202 acres that have moderate potential fossil yield. The mine operation would excavate and relocate approximately 1.96 billion tons of geological material, of which approximately 1.2 billion tons would be waste rock and 0.7 billion ton would be ore.

Soils and Revegetation

Impacts from the Barrel Alternative to soils and revegetation would be the same as under the proposed action, except that the Barrel Alternative would result in the loss of 5,431 acres of soil productivity by direct impact of the mine footprint (compared with 5,612 acres under the proposed action), and sediment delivery to the surface drainages would be about 22,170 tons annually (compared with 16,000 tons annually under the proposed action).

Air Quality and Climate Change

Under the Barrel Alternative, all criteria pollutants would meet NAAQS at the perimeter fenceline.

Groundwater Quantity

Under the Barrel Alternative, impacts to groundwater quantity would be identical to the proposed action, with one exception: groundwater outflow from Davidson Canyon to Cienega Creek would potentially be reduced by a maximum of 4.4 percent (compared with 11.7 percent under the proposed action).

Surface Water Quantity

The Barrel Alternative would result in the direct loss of 15 stock tanks and the potential to indirectly impact 5 stock tanks downstream. Stormwater flow from the area would be reduced by 17 percent (compared with 46 percent under the proposed action), and flow in Davidson Canyon would be reduced by 4 percent (compared with 10 percent under the proposed action). All other impacts to surface water quantity would be the same as identified under the proposed action.

Surface Water Quality

Impacts from the Barrel Alternative to surface water quality would be the same as under the proposed action, with the exception that the Barrel Alternative would result in the direct loss of 40.0 acres of jurisdictional WUS (compared with 42.5 acres under the proposed action) and the indirect loss of 28.4 of jurisdictional WUS (compared with 36.9 acres under the proposed action), for a total loss of jurisdictional WUS of 68.4 acres.

Seeps, Springs, and Riparian Areas

Impacts from the Barrel Alternative to seeps, springs, and riparian areas would be the same as under the proposed action, with the following exception: this alternative would impact 588 acres of Pima County Mapped Riparian Habitat (compared with 686 acres under the proposed action). In addition to this riparian habitat, 13 riparian areas associated with springs would be directly or indirectly disturbed with high certainty, and an additional 36 riparian areas associated with springs may be indirectly disturbed but with lower certainty.

Biological Resources

The Barrel Alternative would result in the direct, long-term or permanent impacts to 5,431 acres of terrestrial vegetation communities (which serve as habitat for plants and animals) because they would be cleared or buried under waste rock or tailings as a result of the construction of the mine facilities and connected actions. Impacts to biological resources would be similar to the proposed action, with the exception of one population of Coleman's coral-root that would not be directly impacted by the waste rock and tailings facilities and would be fenced off. One animal movement corridor more than for the proposed action would be disrupted, and small amounts of three movement corridors would be restored due to decommissioning of roads. Direct and indirect impacts to these species would be equivalent to the impacts of the proposed action.

Livestock Grazing

Impacts from the Barrel Alternative to livestock grazing would be the same as under the proposed action, with the following exceptions: a change from fully capable of supporting grazing activities to partially capable on 4,040 acres of the Rosemont grazing allotment, 178 acres of the Thurber allotment, less than 1 acre of the Greaterville allotment, and 9 acres of the Helvetia allotment; the DeBaud and Stone Springs allotments would not be impacted. Fifteen stock ponds and 76 springs would be impacted, and a potential reduction of 862 to 919 AUMs would occur.

Dark Skies

The amount of lumens produced under the Barrel Alternative would be 6,423,646, slightly lower than the Phased Tailings, Barrel Trail, or Scholefield-McCleary Alternatives due to the removal of oxide ore processing.

Visual Resources

The Barrel Alternative would adversely impact visual resources in a manner similar to the proposed action; however, the open-pit face would be permanently visible. The plant site would be visible for up to 10 years and then partially screened by waste rock and tailings facilities. There would be impacts to 4,228 acres within the Santa Rita Ecosystem Management Area with very high and high scenic integrity characteristics. There would be 42.5 miles of project area visibility along forest roads and trails with concern levels 1 and 2, and 3.9 miles of scenic quality impacts along SR 83. There would be 264,795 acres within the analysis area with project visibility.

Mitigation measures to reduce the impact to visual resources would be similar to those for the proposed action.

Recreation and Wilderness

Overall impacts to recreation would be the same as described for the proposed action. The Barrel Alternative would impact 6,990 acres of the Recreation Opportunity Spectrum, including these categories: 0 acres of semiprimitive nonmotorized, 6,177 acres of semiprimitive motorized, 169 acres of roaded modified, and 644 acres of roaded natural. Impacts to hunting would be the same as under the proposed action. A total of 18.5 miles of NFSRs would be lost, and 12.8 miles of the Arizona National Scenic Trail would be relocated. For this alternative, as well as for the Barrel Trail and Scholefield-McCleary Alternatives, a segment of the Arizona National Scenic Trail would be relocated to the east side of SR 83. While portions of the trail in this location would still have views of the mine site, this location offers views of undisturbed landscapes to the north, east, and south and is far enough from the mine site that noise and other industrial aspects of the mine would be less dominant.

Hazardous Materials

Under the Barrel Alternative, the risk of release to and effect of hazardous materials on the environment would be the same as under the proposed action, with one substantial exception: the removal of the heap leach and oxide ore processing facilities would eliminate the need to use sulfuric acid and would reduce the use of petroleum products, thereby reducing the overall risk. A reduced risk for accidental release of petroleum products during transportation and within the mine site would also exist for this alternative because it would eliminate the need for kerosene.

Transportation/Access

Impacts from the Barrel Alternative to transportation/access would be similar to those under the proposed action, with slight variations in worker commute traffic and truck traffic, compared with the proposed action, as a result of the removal of the heap leach and oxide ore processing facilities. These variations would not change the level of service impact that mine related traffic and general traffic increases by population growth would have on the analyzed roadways, as described under the proposed action. Approximately 35 miles of existing NFSRs would be decommissioned by the mine, with an additional 18.5 miles restricted by mine operations.

Public Health and Safety

Under the Barrel Alternative, risks to public health and safety would exist from the storage, use, and transportation of hazardous materials, but to a lesser extent, compared with the proposed action. The reduced risk would be the result of the removal of the heap leach and oxide ore processing facilities from this alternative. By removing these facilities, 63 deliveries of sulfuric acid per week would not occur during the active mining phase, compared with the proposed action, and onsite storage of sulfuric acid in three 900-ton tanks would not occur. Because of the reduced use of hazardous materials under the Barrel Alternative, demand for emergency response to accidents or spills on public roadways or at the mine site would be reduced as well. The Barrel Alternative meets NAAQs for all criteria pollutants at the perimeter fenceline.

Cultural Resources

The Barrel Alternative, including the utility corridor, would impact 82 historic properties, consisting of 30 prehistoric sites known or likely to have human remains. Sixteen sacred springs are likely to be impacted under this alternative. The Barrel Alternative would impact 6,990 acres of traditional resource collection areas.

Otherwise, impacts from the Barrel Alternative are identical to the proposed action.

Socioeconomics and Environmental Justice

Changes in employment over time; changes in property value; changes in tax base per year over time; change in the demand and cost for road maintenance on State highways; change in demand and cost for emergency services over time; economic effects on the astronomy industry; the ability to meet quality of life expectations for a rural landscapes; economic effects on amenity-based relocation; and impacts to populations protected by Title VI of the Civil Rights Act would be the same as with the proposed action.

With respect to changes in tourism, the Barrel Alternative would be expected to directly decrease nature-based visitor spending by \$1.4 million to \$4.7 million per year. An estimated 15 to 50 percent decrease in nature-based tourism between 0 and 10 miles from the proposed mine would occur. Indirect effects in the greater Tucson area are expected to include an estimated \$621,900 to \$2.1 million reduction in output per year.

Santa Cruz County could experience a 0.09 percent of county population decrease in net migration as a result of the proposed action. The Patagonia Census County Division could experience a 6 to 37 percent decrease in population growth rate. These decreases in amenity-based migration may be offset by an increase in mine staff relocations to these areas. Impacts to amenity migration in Pima

County and the greater Tucson metropolitan area are expected to be negligible due to the more dynamic nature of the metropolitan economy.

Alternative 5 – Barrel Trail Alternative

Impacts on these resources would be the same as under the proposed action: fuels and fire management, groundwater quality, hazardous materials, landownership and boundary management, noise, and transportation/access. Because the revised lighting plan would be applicable to the Barrel Trail Alternative, impacts to dark skies from the Barrel Trail Alternative would be the same as the impacts described under the Phased Tailings Alternative.

Geology, Minerals, and Paleontology

Impacts to geology and minerals and the potential for subsidence would be the same as under the proposed action. The Barrel Trail Alternative would disturb 3,541 acres that have moderate potential fossil yield. The mine operation would excavate and relocate approximately 1.78 billion tons of geological material, of which approximately 1.2 billion tons would be waste rock and 0.5 billion ton would be ore.

Soils and Revegetation

Impacts from the Barrel Trail Alternative to soils and revegetation would be the same as under the proposed action, except that the Barrel Trail Alternative would result in the loss of 5,888 acres of soil productivity by direct impact of the mine footprint (compared with 5,612 acres under the proposed action), and sediment delivery to the surface drainages would be about 20,300 tons annually (compared with 16,000 tons annually under the proposed action).

Air Quality and Climate Change

Under the Barrel Trail Alternative, impacts to air quality would be the same as those identified under the proposed action, with all criteria pollutants meeting NAAQS at the perimeter fenceline except for PM₁₀.

Groundwater Quantity

Under the Barrel Trail Alternative, impacts to groundwater quantity would be identical to those under the proposed action, with one exception: groundwater outflow from Davidson Canyon to Cienega Creek would potentially be reduced by a maximum of 10.7 percent (compared with 11.7 percent under the proposed action).

Surface Water Quantity

The Barrel Trail Alternative would result in the direct loss of 15 stock tanks and the potential to indirectly impact of 5 stock tanks downstream. Stormwater flow from the area would be reduced by 42 percent (compared with 46 percent under the proposed action), and flow in Davidson Canyon would be reduced by 11 percent (compared with 10 percent under the proposed action). All other impacts to surface water quantity would be the same as identified under the proposed action.

Surface Water Quality

Impacts from the Barrel Trail Alternative to surface water quality would be the same as under the proposed action, with the exception that the Barrel Trail Alternative would result in the direct loss of 50.0 acres of jurisdictional WUS (compared with 42.5 acres under the proposed action), and the indirect loss of 34.1 acres of jurisdictional WUS (compared with 36.9 acres under the proposed action), for a total loss of jurisdictional WUS of 84.1 acres.

Seeps, Springs, and Riparian Areas

Impacts from the Barrel Trail Alternative to seeps, springs, and riparian areas would be the same as under the proposed action, with the following exception: this alternative would impact 633 acres of Pima County Mapped Riparian Habitat (compared with 686 acres under the proposed action). In addition to this riparian habitat, 13 riparian areas associated with springs would be directly or indirectly disturbed with high certainty; and an additional 36 riparian areas associated with springs may be indirectly disturbed but with lower certainty.

Biological Resources

The Barrel Trail Alternative would result in the direct, long-term or permanent impacts of 5,888 acres of terrestrial vegetation communities (which serve as habitat for plants and animals) because they would be cleared or buried under waste rock or tailings as a result of the construction of the mine facilities and connected actions. Impacts to biological resources would be similar to the proposed action, with the exception of one population of Coleman's coral-root that would not be directly impacted by the waste rock and tailings facility and would be fenced off. One animal movement corridor more than for the proposed action would be disrupted, and small amounts of three movement corridors would be restored due to decommissioning of roads. Direct and indirect impacts to these species would be equivalent to the impacts of the proposed action.

Livestock Grazing

The Barrel Trail Alternative would result in a change from fully capable of supporting grazing activities to partially capable on 4,454 acres of the Rosemont grazing allotment, 230 acres of the Thurber allotment, 1 acre of the Greaterville allotment, no acres of the DeBaud and Stone Springs allotments, and less than 1 acre of the Helvetia allotment. A potential reduction of 975 to 1,001 AUMs would occur. Fifteen stock ponds and 76 springs would be impacted.

Visual Resources

The Barrel Trail Alternative would adversely impact visual resources in a manner similar to the Barrel Alternative. The plant site would be visible for up to 10 years and then partially screened by waste rock and tailings facilities. There would be impacts to 4,688 acres within the Santa Rita Ecosystem Management Area with very high and high scenic integrity characteristics. There would be 39.6 miles of project area visibility along forest roads and trails with concern levels 1 and 2, and 4.9 miles of scenic quality impacts along SR 83. There would be 260,589 acres within the analysis area with project visibility.

Mitigation measures to reduce the impact to visual resources would be similar to those for the proposed action. In addition, under the Barrel Trail Alternative, mitigation to reduce visual impacts would include construction of more variable topography to replicate natural landforms. This would

have minor or no beneficial impact in the short and long term, but after sufficient vegetation coverage became established, the variable topography would beneficially reduce visual contrasts.

Recreation and Wilderness

Overall impacts to recreation would be the same as described for the proposed action. The Barrel Trail Alternative would impact 6,994 acres of the Recreation Opportunity Spectrum, including these categories: 0 acres of semiprimitive nonmotorized, 6,178 acres of semiprimitive motorized, 169 acres of roaded modified, and 647 acres of roaded natural. A total of 18.5 miles of NFSRs would be lost, and 12.8 miles of the Arizona National Scenic Trail would be relocated in the same location as described for the Barrel Alternative. Impacts to hunting would be the same as under the proposed action.

Public Health and Safety

Under the Barrel Trail Alternative, risks to public health and safety would be the same as those identified for the proposed action.

Cultural Resources

The Barrel Trail Alternative, including the utility corridor, would impact 106 historic properties, consisting of 36 prehistoric sites known or likely to have human remains. Sixteen sacred springs are likely to be impacted by this alternative. The Barrel Trail Alternative would impact 6,994 acres of traditional resource collection areas.

Otherwise, impacts from the Barrel Alternative would be identical to the proposed action.

Socioeconomics and Environmental Justice

Changes in employment over time; changes in property value; changes in tax base per year over time; change in the demand and cost for road maintenance on State highways; change in demand and cost for emergency services over time; economic effects on the astronomy industry; the ability to meet quality of life expectations for a rural landscapes; economic effects on amenity-based relocation; and impacts to populations protected by Title VI of the Civil Rights Act would be the same as with the proposed action.

With respect to changes in tourism, the Barrel Trail Alternative would be expected to directly decrease nature-based visitor spending by \$1.6 million to \$5.4 million per year. An estimated 15 to 50 percent decrease in nature-based tourism between 0 and 10 miles from the proposed mine would occur. Indirect effects in the greater Tucson area are expected to include an estimated \$721,500 to \$2.4 million reduction in output per year.

Economic effects on amenity-based relocation would be the same as with the Barrel Alternative.

Alternative 6 – Scholefield-McCleary Alternative

Impacts on these resources would be the same as under the proposed action: dark skies, fuels and fire management, groundwater quality, hazardous materials, landownership and boundary management, noise, and public health and safety. Because the revised lighting plan would be applicable to the

Scholefield-McCleary Alternative, impacts to dark skies from the Scholefield-McCleary Alternative would be the same as the impacts described under the Phased Tailings Alternative.

Geology, Minerals, and Paleontology

Impacts to geology and minerals and the potential for subsidence would be the same as under the proposed action. The Scholefield-McCleary Alternative would disturb 2,449 acres that have moderate potential fossil yield. The mine operation would excavate and relocate approximately 1.78 billion tons of geological material, of which approximately 1.2 billion tons would be waste rock and 0.5 billion ton would be ore.

Soils and Revegetation

Impacts from the Scholefield-McCleary Alternative to soils and revegetation would be the same as under the proposed action, except that the Scholefield-McCleary Alternative would result in the loss of 6,197 acres of soil productivity by direct impact of the mine footprint (compared with 5,612 acres under the proposed action), and sediment delivery to the surface drainages would be about 24,200 tons annually (compared with 16,000 tons annually under the proposed action).

Air Quality and Climate Change

Under the Scholefield-McCleary Alternative, PM₁₀ and PM_{2.5} would exceed NAAQS at the perimeter fenceline. All other criteria pollutants would meet NAAQS at the perimeter fenceline. Overall increases in criteria pollutants and VOCs, as modeled at the perimeter fenceline, are higher under the Scholefield-McCleary Alternative than under the other action alternatives.

Groundwater Quantity

Under the Scholefield-McCleary Alternative, impacts to groundwater quantity would be identical to those of the proposed action, with one exception: groundwater outflow from Davidson Canyon to Cienega Creek would potentially be reduced by a maximum of 5.8 percent (compared with 11.7 percent under the proposed action).

Surface Water Quantity

The Scholefield-McCleary Alternative would result in the direct loss of five stock tanks and the potential to indirectly impact six stock tanks downstream. Stormwater flow from the area would be reduced by 23 percent (compared with 46 percent under the proposed action), and flow in Davidson Canyon would be reduced by 6 percent (compared with 10 percent under the proposed action). All other impacts to surface water quantity would be the same as under the proposed action.

Surface Water Quality

Impacts from the Scholefield-McCleary Alternative to surface water quality would be the same as under the proposed action, with the exception that the Scholefield-McCleary Alternative would result in the direct loss of 26.2 acres of jurisdictional WUS (compared with 42.5 acres under the proposed action) and the indirect loss of 22.7 acres of jurisdictional WUS (compared with 36.9 acres under the proposed action), for a total loss of jurisdictional WUS of 48.9 acres.

Seeps, Springs, and Riparian Areas

Impacts from the Scholefield-McCleary Alternative to seeps, springs, and riparian areas would be the same as under the proposed action, with the following exception: this alternative would impact 631 acres of Pima County Mapped Riparian Habitat (compared with 686 acres under the proposed action). In addition to this riparian habitat, 19 riparian areas associated with springs would be directly or indirectly disturbed with high certainty, and an additional 32 riparian areas associated with springs may be indirectly disturbed but with lower certainty.

Biological Resources

The Scholefield-McCleary Alternative would result in the direct, long-term or permanent impacts of 6,197 acres of terrestrial vegetation communities (which serve as habitat for plants and animals) because they would be cleared or buried under waste rock or tailings as a result of the construction of the mine facilities and connected actions. Impacts to biological resources would be similar to those of the proposed action, with the exception of one population of Coleman's coral-root that would not be directly impacted by the waste rock facilities and would be fenced off. One animal movement corridor more than for the proposed action would be disrupted, and small portions of up to four movement corridors would be restored due to decommissioning of roads. Direct and indirect impacts to these species would be equivalent to the impacts of the proposed action.

Livestock Grazing

The Scholefield-McCleary Alternative would result in a change from fully capable of supporting grazing activities to partially capable on 3,835 acres of the Rosemont grazing allotment, no acres of the Thurber, Greaterville, and Helvetia allotments, 1,031 acres of the DeBaud allotment, and 77 acres of the Stone Springs allotment. A potential reduction of 1,009 to 1,045 AUMs would occur. Five stock ponds and 79 springs would be impacted.

Visual Resources

The Scholefield-McCleary Alternative would adversely impact visual resources in a manner similar to the proposed action but would have greater adverse impacts from the open views of pit face and diversion channel, as well as being visible from the west side of the Santa Rita Mountains. There would be impacts to 5,045 acres within the Santa Rita Ecosystem Management Area with very high and high scenic integrity characteristics. There would be 39.8 miles of project area visibility along forest roads and trails with concern levels 1 and 2, and 3.5 miles of scenic quality impacts along SR 83. There would be 763,295 acres within the analysis area with project visibility (due to being visible from the west side of the Santa Rita Mountains).

Mitigation measures to reduce the impact to visual resources would be similar to those for the proposed action.

Transportation/Access

Impacts from the Scholefield-McCleary Alternative to transportation/access would be similar to those under the proposed action, the exception of road decommissioning and road restrictions. Approximately 47 miles of existing NFSRs would be decommissioned by the mine, with an additional 28.5 miles restricted by mine operations.

Public Health and Safety

Under the Scholefield-McCleary Alternative, risks to public health and safety would be the same as those identified for the proposed action, with one exception: PM_{2.5} would not comply with NAAQS for human health at the perimeter fenceline.

Recreation and Wilderness

Overall impacts to recreation would be the same as described for the proposed action. The Scholefield-McCleary Alternative would result in the loss of 8,885 acres of the Recreation Opportunity Spectrum, including these categories: 130 acres of semiprimitive nonmotorized, 8,487 acres of semiprimitive motorized, 0 acres of roaded modified, and 268 acres of roaded natural. A total of 28.5 miles of NFSRs would be lost, including 5.7 miles of existing NFSRs in Sycamore Canyon no longer available for public motorized access. Relocation of 12.8 miles of the Arizona National Scenic Trail would occur in the same location as described for the Barrel Alternative. Impacts to hunting would be the same as under the proposed action.

Cultural Resources

The Scholefield-McCleary Alternative, including the utility corridor, would impact 76 historic properties, consisting of 15 prehistoric sites known or likely to have human remains. Twenty-two sacred springs are likely to be impacted by this alternative. The Scholefield-McCleary Alternative would impact 8,889 acres of traditional resource collection areas. Otherwise, impacts from the Scholefield-McCleary Alternative would be identical to those of the proposed action.

Socioeconomics and Environmental Justice

Changes in employment over time; changes in property value; changes in tax base per year over time; change in the demand and cost for road maintenance on State highways; change in demand and cost for emergency services over time; economic effects on the astronomy industry; the ability to meet quality of life expectations for a rural landscapes; economic effects on amenity-based relocation; and impacts to populations protected by Title VI of the Civil Rights Act would be the same as with the proposed action.

With respect to changes in tourism, the Phased Tailings Alternative would be expected to directly decrease nature-based visitor spending by \$1.6 million to \$5.5 million per year. An estimated 15 to 50 percent decrease in nature-based tourism between 0 and 10 miles from the proposed mine would occur. Indirect effects in the greater Tucson area are expected to include an estimated \$731,400 to \$2.4 million reduction in output per year.

Santa Cruz County could experience a 0.09 percent of county population decrease in net migration as a result of the proposed action. The Patagonia Census County Division could experience a 6 to 38 percent decrease in population growth rate. These decreases in amenity-based migration may be offset by an increase in mine staff relocations to these areas. Impacts to amenity-based migration in Pima County and the greater Tucson metropolitan area are expected to be negligible due to the more dynamic nature of the metropolitan economy.

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Chapter 1. Purpose of and Need for Action

Introduction

Land managers for the Coronado National Forest (the Coronado), an administrative unit of the U.S. Department of Agriculture Forest Service (Forest Service), prepared this final environmental impact statement (FEIS) to evaluate the potential effects of activities proposed in a preliminary mine plan of operations (MPO) (WestLand Resources Inc. 2007a) submitted by Augusta Resource Corporation (Augusta Resource), the parent company of Rosemont Copper Company (Rosemont Copper), for development of the Rosemont ore deposit.

The preliminary MPO presented in this document addresses activities proposed on lands administered by the Forest Service for which Federal decisions are required.

Rosemont Copper's preliminary MPO describes proposed construction, operation, reclamation, and closure of an open-pit mine to extract locatable minerals such as copper, molybdenum, and silver.³ The preliminary MPO also describes associated infrastructure and ancillary facilities. Associated infrastructure consists of haul roads, access roads, and maintenance roads, ore transportation systems, ore processing facilities, waste rock and tailings areas, leach facilities, and electrical and water transmission lines. Ancillary facilities consist of various buildings integral to the operations (i.e., administration building, employee change house, warehouse, analytical laboratory, vehicle servicing facilities, storage facilities, guard house, and truck scale).

The proposed mine site is located on the east side of the Santa Rita Mountains of the Nogales Ranger District, approximately 30 miles south of Tucson, Arizona (figure 1). Activity is proposed on approximately 995 acres of private land owned by Rosemont Copper, 3,670 acres of National Forest System (NFS) land, and 75 acres of Arizona State Land Department land administered as a State Trust. The mine life, including construction, operation, reclamation, and closure, is approximately 24.5 to 30 years and may include beneficial and adverse impacts on the human environment.⁴

Two Federal agencies have authority regarding the preliminary MPO approval and permitting process: the Forest Service and U.S. Army Corps of Engineers (USACE). The Forest Service is the lead agency conducting the National Environmental Policy Act (NEPA) review of the MPO. There are 17 cooperating Federal, State, and local agencies with jurisdiction or special expertise related to aspects of the preliminary MPO, including the USACE.⁵

The preliminary MPO was concurrently submitted by Rosemont Copper to the Bureau of Land Management (BLM) for review and approval. This is because the MPO initially included an electrical transmission line, water pipeline, and access road that were proposed to cross BLM-administered lands. Because on June 12, 2012, the Arizona Corporation Commission (ACC) selected an electrical transmission line pathway that does not cross land administered by the BLM, Rosemont Copper subsequently withdrew the MPO from consideration by the BLM.

³ Trace amounts of gold are anticipated to be recovered during the offsite refining processes; however, recovery rates are not expected to be significant.

⁴ The draft environmental impact statement (DEIS) gave the mine life as 20 to 25 years. However, this only refers to the operational mine life, and it has been corrected in the FEIS. The stages of mine life are as follows: premining (18 to 24 months), active mining (20 to 25 years), final reclamation and closure activities (3 years), and postclosure (indefinite).

⁵ The relationships between cooperating agencies and the Forest Service are governed by signed memoranda of understanding; these can be found in the project record.

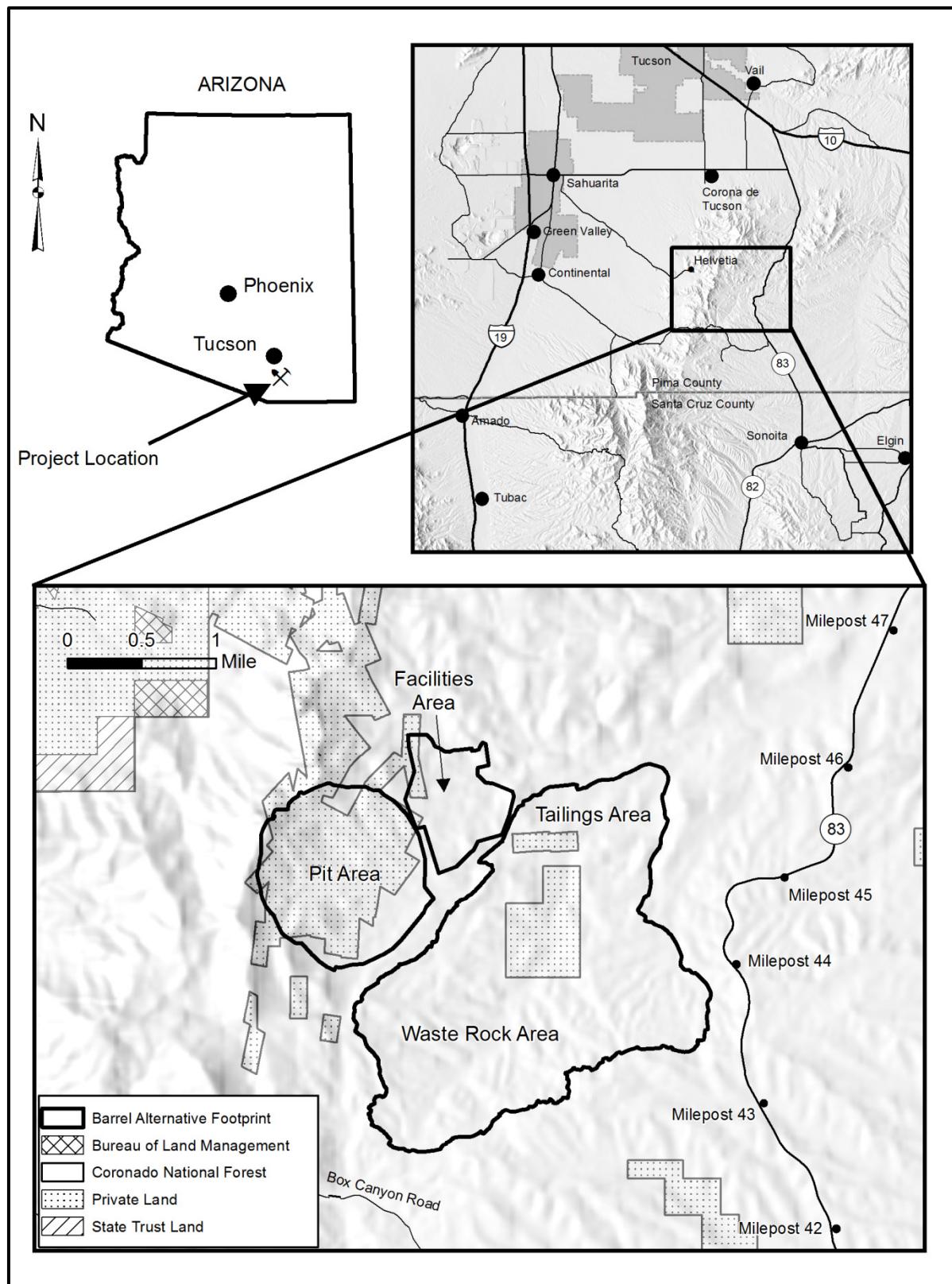


Figure 1. Project location and Barrel Alternative footprint

Changes from the Draft Environmental Impact Statement

In response to public and agency comments on the DEIS, a number of changes were made to chapter 1.

- Minor edits were made to improve clarity and correct misspellings and grammatical errors.
- Language related to the decision authority of the BLM was removed.
- Minor changes to the organization of some sections were made to improve clarity.
- An additional issue statement was added for transportation. Transportation issues were addressed in several nontransportation issue statements and factors in the DEIS. However, in response to public comments and to improve clarity, this topic is now addressed in a separate issue statement.
- Minor changes were made to clarify the duration of the various phases of mine life, as well as the overall mine life.
- Minor changes to the wording of issue statements and factors were made to improve clarity.

Many comments on the DEIS expressed disagreement with its discussion of the responsible official's decision space. The laws and regulations that define the decision space for this mining project were reviewed in response to these comments. The Forest Service determined that the interpretation described in the DEIS is accurate.

Several comments asked that the Forest Service reconsider its purpose and need statement. The purpose of and need for action stated in this chapter was reviewed in light of current regulations and policy, and the Forest Service determined that the statement in the DEIS was appropriate. One paragraph dealing with applicable laws and regulations that was in the "Purpose of and Need for Action" section of chapter 1 of the DEIS was moved to the "Decision Framework" section of chapter 1 of the FEIS for improved clarity.

Document Structure

The Coronado and its consultants prepared this document in compliance with NEPA and other relevant laws, regulations, and policies. This document discloses the direct, indirect, and cumulative environmental consequences that would result from the Coronado's approval of the preliminary MPO or alternatives to it. This document considers a necessary amendment to the "Coronado National Forest Land and Resource Management Plan," as amended (forest plan) (U.S. Forest Service 1986), which governs overall management of the Coronado National Forest.

This document is organized into four volumes: volume 1, which contains an executive summary and chapters 1 and 2; volume 2, which contains all of chapter 3; volume 3, which contains chapters 4 and 5, literature cited, and the glossary; and volume 4, containing the appendix, which consists of multiple parts. The general contents of each volume follow.

Volume 1

- *Executive Summary:* The Executive Summary is intended to provide a brief overview of the contents of chapters 1 through 3 of the EIS.
- *Chapter 1. Purpose of and Need for Action:* Chapter 1 focuses on the underlying need to which the lead agency (Forest Service) is responding in proposing the action and alternatives,

the framework in which decisions will be made by the Forest Service and the USACE, and the significant issues associated with the proposed action.

- *Chapter 2. Alternatives, Including the Proposed Action:* Chapter 2 describes the proposed action, along with the alternatives considered in detail. Action alternatives were developed based on significant issues raised by the public, Coronado resource specialists, and other agencies. The no action alternative is included in the range of alternatives considered in detail. Chapter 2 identifies the Coronado's preferred alternative, as well as alternatives considered but eliminated from detailed study. The chapter concludes with a summary that compares the environmental consequences of each alternative, based on the effects disclosed in chapter 3.

Volume 2

- *Chapter 3. Affected Environment and Environmental Consequences:* Chapter 3 describes the affected environment and the environmental consequences associated with the proposed action and the alternatives considered in detail. The resources described under the affected environment headings represent baseline environmental conditions, incorporating past and present actions, for determining potential impacts. Environmental consequences are the potential direct and indirect effects of each alternative and, where applicable, account for mitigation measures included in the proposal and alternatives. Reasonably foreseeable actions are considered in combination with the effects of each alternative to define the potential for cumulative effects. Cumulative effects reflect the findings of resource-specific analyses of additive impacts from any relevant past, present, and reasonably foreseeable actions. Irreversible and irretrievable commitments of resources, the relationship between short-term uses and long-term productivity of the environment, and adverse environmental impacts that cannot be avoided are disclosed in a section at the end of chapter 3. Chapter 3 provides the analyses for the comparison summary presented in chapter 2.
- Volume 2 contains the introduction to chapter 3, along with the following resource sections: "Geology, Minerals, and Paleontology;" "Soils and Revegetation;" "Air Quality and Climate Change;" "Groundwater Quantity;" "Groundwater Quality and Geochemistry;" "Surface Water Quantity;" "Surface Water Quality;" "Seeps, Springs, and Riparian Areas;" and the "Affected Environment" part of "Biological Resources."

Volume 3

- Chapter 3. Affected Environment and Environmental Consequences, Continued.
- Volume 3 contains the "Environmental Consequences" part of "Biological Resources," along with the following resource sections: "Landownership and Boundary Management;" "Livestock Grazing;" "Dark Skies;" "Visual Resources;" "Recreation and Wilderness;" "Hazardous Materials;" "Fuels and Fire Management;" "Transportation/Access;" "Noise;" "Public Health and Safety;" "Cultural Resources;" and "Socioeconomics and Environmental Justice." The resource sections are followed by "Required Disclosures."

Volume 4

- *Chapter 4. Consulted Parties:* Chapter 4 identifies the cooperating agencies and consulting agencies, including tribal governments, involved during the development of this document.

- *Chapter 5. List of Preparers:* Chapter 5 identifies the individuals responsible for the development of this document.
- *Glossary:* The glossary provides definitions of terms used in this document.
- *Literature Cited:* This section provides a list of literature cited in this document.
- *Index:* The index indicates where keywords can be found within the document.

Volume 5

Appendix

- Each part of the appendix provides detailed information in support of the analyses and conclusions reported in chapter 3. Note that some of those are provided only on compact disc (CD), which is included with this document. In this environmental impact statement (EIS), volume 5 contains the following:
 - H. U.S. Army Corps of Engineers' Section 404(b)(1) Alternatives Analysis
 - I. Mitigation and Monitoring Plan (includes U.S. Army Corps of Engineers' Habitat Mitigation Plan)
 - J. Visual Simulations (on CD)
 - K. Memorandum of Agreement (prepared under Section 106 of the National Historic Preservation Act)
 - L. Tribal Consultation

Volume 6

Appendix, Continued

- In this EIS, volume 6 contains the following:
 - M. U.S. Fish and Wildlife Service Biological Opinion
 - N. Summary of Response to Comments on the DEIS (comments and responses on CD)

The analyses conducted for this project reflect the best available science.⁶ Supporting documentation is found in the project record, located at the Coronado Supervisor's Office (Tucson, Arizona). Documents are available to the public in accordance with the provisions of the Freedom of Information Act (5 United States Code (U.S.C.) 552), as amended, including its exemptions.

The information furnished in this document, along with supporting documentation contained in the project record, provides site-specific information and conclusions that inform responsible Federal officials prior to their rendering reasoned decisions. In compliance with 40 Code of Federal Regulations (CFR) 1502.21, the EIS should briefly describe material incorporated by reference for the sake of brevity. Hence, all material incorporated in the EIS by reference is contained in the project record. Effects are discussed in proportion to their significance, with emphasis on items deemed most useful to decision makers and the public.

⁶ What constitutes best available science might vary over time and across scientific disciplines. Agency regulations require that public information be of "high quality" because "accurate scientific analysis, expert agency comments, and public scrutiny are essential to implementing NEPA" (see 40 CFR 1500.1(b), 1502.9(b), 1502.22, and 1502.24).

Background

The current preliminary MPO (WestLand Resources Inc. 2007a) for the Rosemont Copper Project is the latest in an extensive history of copper prospecting and development in this area of southern Arizona. Copper production in the Santa Rita Mountains began in the 1880s and continued until the 1950s. Previous mining activity on the east side of the Santa Rita Mountains supported operation of the Rosemont smelter in the Rosemont mining district. Previous mining activity on the west side of the Santa Rita Mountains supported operation of the Columbia smelter at Helvetia in the Helvetia mining district. Although several exploration projects have been undertaken, there has been no recent production of copper at or near this location. The rising value of copper over the past several years has increased the economic viability of mining the Rosemont ore deposit.

In July 2007, Rosemont Copper submitted a preliminary MPO to the Coronado, requesting approval to construct, operate, reclaim, and close an open-pit mine on and adjacent to NFS lands administered by the Coronado for development of the Rosemont ore deposit. The Forest Service's review of the preliminary MPO identified the need for additional information. In February 2008, a supplemental preliminary MPO was accepted for environmental review by the Coronado.

At the request of Rosemont Copper, the USACE reviewed a preliminary delineation for potentially jurisdictional waters of the United States (WUS) submitted in accordance with regulatory guidance letter no. 08-02. The USACE has determined that potentially jurisdictional WUS are present within the proposed project area. These waters are discussed in the "Surface Water Quality" section of chapter 3.

Purpose of and Need for Action

The following section briefly describes the underlying purpose and need to which the Coronado is responding in proposing the alternatives, including the proposed action (40 CFR 1502.13). The Coronado's overall purpose and need is to process Rosemont Copper's MPO. Rosemont Copper is entitled to conduct operations that are reasonably incidental to exploration and development of mineral deposits on its mining claims pursuant to applicable U.S. laws and regulations and is asserting its right under the General Mining Law to mine and remove the mineral deposit subject to regulatory laws.

From the perspective of the Forest Service, the need for action is to:

- Respond to Rosemont Copper's proposed MPO to develop and mine the Rosemont copper, molybdenum, and silver deposit;
- Ensure that the selected alternative would comply with other applicable Federal and State laws and regulations;
- Ensure that the selected alternative, where feasible, would minimize adverse environmental impacts on NFS surface resources; and
- Ensure that measures would be included that provide for reclamation of the surface disturbance.

The role of the Coronado under its primary authorities in the Organic Administration Act, Locatable Regulations (36 CFR 228 Subpart A), and the Multiple-Use Mining Act is to ensure that mining activities minimize adverse environmental effects on NFS lands and comply with all applicable environmental laws. The Coronado may impose reasonable conditions to protect surface resources.

but cannot materially interfere with reasonably necessary activities under the General Mining Law that are otherwise lawful. Through the Mining and Mineral Policy Act, Congress has stated that it is the continuing policy of the Federal Government, in the national interest, to foster and encourage private enterprise in:

- The development of economically sound and stable domestic mining, minerals, and metal and mineral reclamation industries; and
- The orderly and economic development of domestic mineral resources, reserves, and reclamation of metals and minerals to help ensure satisfaction of industrial, security, and environmental needs;

The Coronado is evaluating the proposed action at this time in order to comply with its statutory obligations (see below) to respond to Rosemont Copper's preliminary MPO in a timely manner. The actions proposed in this FEIS describe the development of the Rosemont ore deposit owned and/or claimed by Rosemont Copper in a manner that: (1) complies with Federal, State, and local laws and regulations, (2) reduces adverse environmental impacts on NFS lands, and (3) is the least environmentally damaging practicable alternative in accordance with 40 CFR 230 as it pertains to Section 404 of the Clean Water Act (CWA).

The purpose of and need for action is based on statutes, regulations, and policies that govern mining on NFS lands, as follows:

- The General Mining Law of 1872 confers a statutory right for claimants to enter upon public lands open to location, stake mining claims in pursuit of locatable minerals, and conduct mining activities in compliance with Federal and State statutes and regulations.
- The 1897 Organic Administration Act grants the Secretary of Agriculture the authority to regulate the occupancy and use of NFS lands. It provides the public with continuing rights to conduct mining activities under general mining laws and in compliance with rules and regulations applicable to NFS lands. It also recognizes the rights of miners and prospectors to access NFS lands for prospecting, locating, and developing mineral resources.
- The Multiple Use Mining Act of 1955 confirms that citizens may conduct mining activities on public lands, locate necessary facilities, and conduct reasonable and incidental uses to mining on public lands, including NFS lands.
- The Multiple Use-Sustained Yield Act of 1960 requires that NFS lands be administered in a manner that includes consideration of relative values of various resources as part of management decisions. Furthermore, it specifies that nothing in the act be construed to affect the use of mineral resources on NFS lands.
- The Mining and Minerals Policy Act of 1970 established the Federal Government's policy for mineral development "to foster and encourage private enterprise in the development of economically sound and stable industries and in the orderly development of domestic resources to help assure satisfaction of industrial, security, and environmental needs."
- Forest Service mining regulations at 36 CFR 228 Subpart A provides direction on the administration of locatable mineral operations on NFS lands.

With regard to mining, one goal of the Coronado forest plan is to "support environmentally sound energy and minerals development and reclamation" (U.S. Forest Service 1986:11). The forest is meeting this goal by considering the preliminary MPO and disclosing the potential environmental impacts that would result if it is approved. Other goals, objectives, standards and guidelines in the

forest plan are also applicable to the proposed action. An initial evaluation of the preliminary MPO with regard to the elements of the forest plan indicates that certain aspects of the preliminary MPO are inconsistent with plan guidance. An amendment to the forest plan is proposed and included in this FEIS. The amendment would create a new forest management area for which specific standards and guidelines would be established relative to a large-scale mining operation. The amendment would ensure the project's consistency with the forest plan should the preliminary MPO or another action alternative be selected and approved.

Proposed Action in Brief

The NEPA process begins with a proposed action, in this case the preliminary MPO submitted by Rosemont Copper. It should be noted that the proposed action is one of several alternatives considered in the FEIS. The *proposed action* should not be confused with the *preferred alternative*, which is identified in chapter 2 and is the agency's current preference for implementation based on the current analysis, or with the *selected action*, which is identified in the record of decision (ROD).

The agency's proposed action is to approve the preliminary MPO for construction, operation with concurrent reclamation, and closure of an open-pit copper, molybdenum, and silver mine.

The following elements, which are integral to the project, are included in the proposed action:

- Ore transportation equipment;
- Ore processing facilities;
- Waste rock and tailings facilities;
- Leach facilities;
- Road construction;
- Road maintenance;
- Electrical and water transmission lines;
- Various buildings;
- Mitigation measures to avoid, reduce, or compensate for potential environmental impacts;
- Resource monitoring during premining, active mining, and reclamation and closure phases; and
- Labor requirements for premining, active mining, and reclamation and closure phases.

Connected Actions

The Council on Environmental Quality defines connected actions as actions that are closely related and that: (1) automatically trigger other actions that may require EISs; (2) cannot or will not proceed unless other actions are taken previously or simultaneously; or (3) are interdependent parts of a larger action and depend on the larger action for their justification (40 CFR 1508.25). The Coronado has determined that the following are connected actions that must be evaluated as part of this NEPA review. Additional details of these connected actions are provided in chapter 2.

Electrical Transmission Line

A 138-kilovolt (kV) electrical transmission line and associated facilities would be constructed from the proposed Toro switchyard to the Rosemont substation. Because this decision is made by the ACC, the same transmission line alignment applies to every alternative.

Water Supply Pipeline

A water supply pipeline and ancillary facilities would be constructed to convey mine supply water from supply wells near Sahuarita to the mine site. This pipeline would be co-located with the electrical transmission line and buried where possible. Ancillary facilities include four pump stations and an electrical distribution line that would run from the Rosemont substation to the pump stations on the same towers as the electrical transmission line. Because this supply pipeline was proposed to be co-located with the transmission line, the same alignment applies to all alternatives.

Electrical Distribution Line

An existing 46-kV electrical distribution line that currently provides electrical power to Rosemont Ranch and other private lands is located in an area where tailings and waste rock facilities would be relocated. Therefore, this distribution line would be relocated within the security fence where necessary. The portion of the distribution line that would require relocation varies by alternative, as described in chapter 2.

Arizona National Scenic Trail Reroute

The Las Colinas portion of the Arizona National Scenic Trail currently runs through the project area. Approximately 10 miles of existing trail would be relocated in order to accommodate both the Rosemont Copper Project and continued use of the trail. The portion of the trail to be relocated varies by alternative, as described in chapter 2.

State Route 83 Highway Maintenance and Improvements

The Arizona Department of Transportation (ADOT) has determined that a number of road maintenance and improvement actions would be required to mitigate increased traffic on State Route (SR) 83 associated with the combination of mine activities and anticipated population growth. These actions include a 3-inch pavement overlay from the intersection of the primary access road to the junction with Interstate 10 (I-10); associated striping, raising of guardrails, and resigning; and paving of three existing pullouts to safely accommodate school buses. All actions on NFS lands would occur within the ADOT easement. Because these actions would be required by ADOT, they would apply equally to all alternatives.

A detailed summary of the proposed action, including connected actions, is presented in chapter 2, along with the other action alternatives considered in detail and the no action alternative.

The documents that make up the complete preliminary MPO are filed in the project record.

Decision Framework

The Forest Service is the lead agency in the preparation of this document, in accordance with the Council on Environmental Quality regulations for implementing NEPA at 40 CFR 1501.5. The USACE is a Federal cooperating agency with decisions to be made based on this environmental review. Other agencies are also participating in this review as cooperating agencies, but they will not have a decision to render on this EIS. A list of cooperating agencies can be found in the project record.

Forest Service

The Forest Supervisor of the Coronado National Forest, as the lead agency responsible official for this environmental review of the MPO, determined that preparation of an EIS was required because approving the preliminary MPO could have significant impacts on the human environment (40 CFR 1500). The Coronado Forest Supervisor will consider the beneficial and adverse impacts of each alternative in determining reasonable measures to impose on the MPO for the protection of Coronado National Forest resources.

The Forest Supervisor's decision space is constrained by Forest Service regulations that govern locatable mineral activities on NFS lands (36 CFR 228 Subpart A) and related laws and regulations promulgated by other agencies. These regulations and Federal mining laws (see above) require that the Forest Service respond to parties who submit applications for approval to conduct mining operations on or otherwise use NFS lands in conjunction with mining for part or all of their planned actions. Certain proposed mining activities require submittal of a preliminary MPO. In accordance with regulations at 36 CFR 228.5, the submittal of an MPO by Rosemont Copper triggered Forest Service consideration of whether to approve the preliminary MPO or to require changes or additions deemed necessary to meet the requirements of the regulations for environmental protection set forth in 36 CFR 228.8.

The Forest Service can reasonably regulate mining activities to protect surface resources, but there are statutory and constitutional limits to its discretion when reviewing and approving an MPO. This means that the Forest Service cannot categorically prohibit mining or deny reasonable and legal mineral operations under the law.

Using the analysis in this FEIS and supporting documentation, the Forest Supervisor will make the following decisions regarding NFS lands:

1. Determine whether to approve the preliminary MPO as submitted by Rosemont Copper or another alternative considered in detail in the FEIS. The final decision may be to approve a hybrid of various components of the alternatives considered. Whichever action alternative is selected, it must minimize adverse impacts while allowing development of the mineral resource.
2. Determine whether to approve the preliminary MPO with needed changes or additions that are necessary to satisfy regulations.
3. Determine whether approval of the MPO would be consistent with the forest plan, or whether one or more amendments to the forest plan would be required.

Prior to approval of the final MPO, the Forest Supervisor will require financial assurance or a reclamation bond to ensure that NFS lands and resources involved with the mining operation are reclaimed in accordance with the approved MPO and reclamation requirements (36 CFR 228.8 and 228.13). In accordance with Forest Service policy, the operator would be required to furnish financial assurance or a reclamation bond prior to approval of a final MPO (U.S. Forest Service 2004a). Calculation of the bond amount would occur following approval of the ROD, when sufficient information is known about the decision with which to adequately perform the calculation.

Concurrent with the public release of this FEIS, the Forest Supervisor will also release a draft ROD. The draft ROD will identify changes or additions to the preliminary MPO necessary to reduce, eliminate, or compensate for adverse environmental impacts from the proposed mineral development on NFS lands, as well as any required amendments to the forest plan. This draft decision is subject to

36 CFR 218, “Project-Level Pre-decisional Administrative Review Process,” and 36 CFR 251 Subpart C, “Appeal of Decisions Relating to Occupancy and Use of National Forest System Lands.” Rosemont Copper may appeal the decision pursuant to 36 CFR 215 or 251 (not both); they may appeal the calculation of the bond amount under 36 CFR 251. Other parties who have provided specific written comments during either formal comment periods (Scoping and DEIS) may object to the decision pursuant to 36 CFR 218. For the forest plan amendment conducted under the 1982 planning regulations, the responsible official has elected to use the “Optional Procedures Available during the Planning Rule Transition Period” (the former 36 CFR 217 appeal procedures that were in effect before November 9, 2000, as accessed through the prior planning regulation transition provisions at 36 CFR 219.35 Appendix A, revised as of July 1, 2010).

Following resolution of objections to the draft ROD, a final ROD will be issued. Rosemont Copper will be required to modify the preliminary MPO to align with the description of the selected alternative in the final ROD and resubmit it to the Forest Service for approval, along with the required reclamation bond or other specified financial assurance. After the Forest Service has determined that the post-appeal, revised MPO is satisfactory and that the bond or financial assurance instrument is acceptable, it will notify Rosemont Copper that the MPO has been approved. Implementation of actions that affect NFS lands and resources may not commence until a final MPO is approved and bonding is in place.

U.S. Army Corps of Engineers

The USACE is a cooperating Federal agency in this NEPA review. The USACE regulates the discharge of dredged and/or fill material into jurisdictional WUS, including wetlands, under Section 404 of the CWA. The proposed project would place dredged or fill material within WUS as regulated under Section 404 of the CWA. Washes, wetlands, and stock ponds in the project area, the utility maintenance road, the power line, and the water supply pipeline were surveyed using field methods developed by the USACE (2008a; 2008b). A preliminary jurisdictional waters determination based on the surveys was submitted to the USACE on May 29, 2009, with additional information provided on July 31, 2009, January 5, 2010, and March 1, 2010. The USACE approved the preliminary jurisdictional delineation in November 2010. Two addenda were subsequently submitted to the USACE on March 13 and 15, 2012 (WestLand Resources Inc. 2012a; 2012b).

A Section 404 of the CWA individual permit is required for the discharge of dredged and/or fill material into jurisdictional WUS (33 CFR 323), regardless of whether the activity is on public or private lands. In accordance with the CWA Section 404(b)(1) guidelines (40 CFR 230), the USACE may permit only the least environmentally damaging practicable alternative in light of cost, logistics, and technology.

On December 6, 2011, the USACE issued a public notice (SPL-2008-00816-MB) concerning the agency’s regulatory action for the proposed Rosemont Copper open-pit copper mine. The public was invited to comment on the proposed work. The initial comment period was from December 6, 2011, to January 5, 2012, and the comment period was subsequently extended to January 19, 2012.

Appendix A of this FEIS provides the “U.S. Army Corps of Engineers’ Section 404(b)(1) Alternatives Analysis,” which was completed in addition to the alternatives analysis disclosed in this FEIS. The analysis defines the general project purpose as “to mine copper” and the overall project purpose as “to mine copper using conventional open-pit mining and sulfide (mill and concentrate) and oxide (leach and solvent extraction and electrowinning) ore processing to produce copper and/or copper

precursors, silver, and molybdenum within the mining district of southeastern Arizona (Pinal, Gila, Greenlee, Graham, Cochise, Santa Cruz, and Pinal Counties)."

Based on the USACE's public interest review, the determination of the least environmentally damaging practicable alternative in the Section 404(b)(1) alternatives analysis, and the environmental analysis in this FEIS and supporting documentation, the USACE Los Angeles District Commander will decide whether to:

1. Issue Rosemont Copper a CWA Section 404 individual permit for the discharge of dredged and/or fill material into WUS for the MPO; or
2. Issue Rosemont Copper a CWA Section 404 individual permit with modifications or special conditions; or
3. Deny the CWA Section 404 individual permit.

Following issuance of the FEIS, the USACE will prepare a ROD regarding the Section 404 permit. The USACE administrative appeals process allows the applicant to appeal a denied permit or a proffered permit that the applicant has declined. Details on this process are contained in 33 CFR 331, "Administrative Appeals Process."

Arizona Corporation Commission

The proposed action requires the construction of an electric power transmission line across lands not administered by a Federal agency, as well as NFS lands. The Coronado has determined that this is a connected action that must be evaluated as part of this NEPA review because the sole purpose of the transmission line is to support the mine. According to 40 Arizona Revised Statutes (ARS), Chapter 2, Article 6.2, the ACC established a line siting committee to create procedures in order to provide review of proposed siting transmission and generating facilities.

Utilities providers, in this case Tucson Electric Power Company, are subject to commission/committee jurisdiction and are required to make an application with the commission for a Certificate of Environmental Compatibility (CEC). The committee considered, during public hearings, the matters contained in the application relative to a series of factors specified in ARS 40-360.06. Following these deliberations, the committee made a recommendation to the commission regarding the CEC. The ACC approved a CEC for the Rosemont Copper Project on June 12, 2012. Further details of the location of the transmission line are provided in chapter 2.

The ACC is a State agency; therefore, it does not have authority over the Federal agencies' decisions discussed above. The Forest Service has the authority to site the lines on lands it administers. Siting authority on private and State lands lies with the ACC. However, the Forest Service and the commission/committee have coordinated on the siting of the transmission line to ensure that the locations on NFS and non-NFS lands are compatible.

Tribal Consultation

Several regulations require that Federal agencies consult on a government-to-government basis with federally recognized Native American tribes having traditional interests in and/or ties to the lands potentially affected by a proposed action and alternatives. The Coronado commenced official consultation with 12 tribes in March 2008 upon notice of Rosemont Copper's intent to file a preliminary MPO. The process and results, which addressed a broad spectrum of tribal concerns,

are detailed in “An Ethnohistory of the Rosemont Copper Project Area in the Eastern Santa Rita Mountains, Pima County, Arizona” (Griset 2011). Details of tribal consultation are summarized in the “Cultural Resources” section in chapter 3 and in appendix E of this FEIS.

Public Involvement

Scoping

The Coronado’s efforts to solicit comments on the proposal and the corresponding public participation are described in detail in “Scoping Summary Report 1, Extent of Public Participation” (U.S. Forest Service 2009f).

On March 13, 2008, the Coronado began soliciting comments on the preliminary MPO with publication in the Federal Register of a “Notice of Intent to Prepare an Environmental Impact Statement” (Federal Register 73(50):13527–13529). The Notice of Intent summarized the proposed action and stated that the impacts of the proposed action, including a reclamation plan, amendment to the Coronado forest plan, and connected actions, would be evaluated in the EIS. Six open house public meetings were held as follows: March 18, 2008 (Tucson, Arizona); March 19, 2008 (Green Valley, Arizona); March 20, 2008 (Patagonia, Arizona); April 5, 2008 (Vail, Arizona); April 22, 2008 (Sahuarita, Arizona); and April 23, 2008 (Elgin, Arizona). Approximately 1,000 people attended the open houses. Oral and written comments were solicited at the meetings and accepted on a toll free phone line and by mail, hand delivery, facsimile, and email throughout the initial 30-day scoping period.

On April 29, 2008, a “Corrected Notice of Intent to Prepare an Environmental Impact Statement” was published in the Federal Register (73(83):23181). This notice announced a change in the duration of the scoping comment period and provided information regarding three public hearings. The scoping comment period was extended to July 14, 2008, for a total scoping comment period of 120 days. The public hearings were held as follows: May 12, 2008 (Elgin, Arizona); June 7, 2008 (Sahuarita, Arizona); and June 30, 2008 (Tucson, Arizona). Both oral testimony and written comments were collected at the public hearings. Oral testimony was professionally audio-recorded and documented by a court reporter. A total of 860 people signed in at the public hearings, with 169 people presenting formal oral comments.

On June 27, 2008, in response to public concerns about constraints limiting hearing attendance and participation, the Coronado hosted a toll-free phone hotline for use by the public to provide comments. A total of 302 people left recorded comments, which were transcribed for the project record.

Comments were received from members of Congress and tribal governments; Federal, State, and local agencies; organized interest groups; businesses; and individuals. The Coronado received 11,082 comment submittals during the scoping comment period, 70 percent of which were postcards, petitions, and form-letter submittals. Approximately 16,000 discrete comments were identified among those received. In addition, submittals received during the scoping period from March 13, 2008, through August 1, 2008, were recorded and analyzed. A systematic process referred to as content analysis was used to organize the contents of the submittals. Detailed records about this process are contained in the project record in Scoping Summary Reports 1, 2, and 3.

Twelve significant⁷ issues were identified after content analysis of the scoping comments. Consideration of these issues led, in part, to the development of alternatives to the proposed action that are considered in this FEIS and the approach used for impacts analyses reported in chapter 3.

Public concerns that will be addressed by regulatory agencies during plan and permit approval processes and routine disclosures (see chapter 3) were not considered to be significant issues. For instance, a cumulative effects analysis is required for all resource areas (see chapter 3); therefore, “cumulative effects analysis” is not in and of itself considered a significant issue. Many public comments submitted during the scoping period suggested alternative components that were either considered in detail or eliminated from detailed analysis (see chapter 2).

Finally, certain comments were determined to be outside the scope of this FEIS for one or more of the following reasons: they did not reflect a legitimate cause and effect relationship supported by scientific evidence; they were not relevant to the decision to be made; they were outside the Forest Service’s or USACE’s authority; or they were already decided by law, regulation, or policy. The issues raised in these comments were dismissed from further consideration.

Public Review of the Draft Environmental Impact Statement

On October 19, 2011, a “Notice of Availability of Draft Environmental Impact Statement” for the Rosemont Copper Project DEIS was published in the Federal Register (76(202):64893–64894). The notice of availability began a 90-day public comment period. On January 19, 2012, with the publication of a notice in the Federal Register, the Forest Supervisor extended the formal comment period for the DEIS through January 31, 2012. This extension was necessary because a technical problem with the electronic mail inbox for public comments resulted in the rejection of some comments for a brief period of time on January 18, 2012.

Seven open public meetings were held as follows: November 12, 2011 (Tucson, Arizona); November 19, 2011 (Vail, Arizona); December 1, 2011 (Vail, Arizona); December 7, 2011 (Benson, Arizona); December 8, 2011 (Green Valley, Arizona); December 10, 2011 (Elgin, Arizona); and January 14, 2012 (Sahuarita, Arizona). The first six meetings consisted of both an informational and an oral comment session. The seventh meeting was an oral comment session. Coronado interdisciplinary team (ID team) resource specialists staffed the informational sessions to answer questions and provide information pertinent to the DEIS. Oral comment sessions allowed the public to provide oral comments to the Coronado Forest Supervisor, Coronado Deputy Forest Supervisor, and/or Nogales District Ranger. Oral comments were professionally audio-recorded and documented by a court reporter.

Oral and written comments were also accepted by mail, email, hand delivery, facsimile, and telephone recording, as well as through the project Web site, throughout the formal public involvement period. Documentation of the formal DEIS comment process is contained in the project record. Comments were received from individuals; tribal governments; Federal, State, and local agencies; organized interest groups; and businesses. The Coronado received more than 25,000 submissions during the DEIS comment period. Content analysis was once again completed to categorize the nature of comments received by issue and concern.

⁷ “Significant” issues do not equate to or necessarily result in “significant” impacts. The term is used synonymously with “key” or “relevant” in the context of an analysis of comments received during a NEPA review.

Appendix G contains a summary of Forest Service responses to comments received on the DEIS. Detailed records about this process are contained in the project record.

Issues

A content analysis of scoping comments from tribes, agencies, organizations, and the public by the Coronado ID team identified 12 significant issues to address in the environmental impacts analysis. Those issues and concerns that are not among these 12 and those that have been covered by prior environmental review are discussed only briefly or eliminated from detailed study (40 CFR 1500.1(b), 1500.2(b), 1500.4(c), 1501.7(3), 1502.2(b), and 1506.3). An issue is defined as a point of disagreement, debate, or dispute with a proposed activity based on some anticipated effect. Issues are described in terms of cause and effect; that is, if an action occurs, an impact could result. Issues are addressed by describing comparative factors that provide a way to describe, compare, and contrast the effects of the proposed action and other alternatives, including no action. Significant issues are used to formulate alternatives to the proposed action, develop elements or components of the alternatives, develop mitigation measures, and analyze environmental effects. A summary of significant issues for this project follows.

Issue 1: Impact on Land Stability and Soil Productivity

Ground disturbance from clearing vegetation, grading, and stockpiling soils has the potential to accelerate erosion and reduce soil productivity. The tailings and waste rock facilities could be unstable over time, and reclamation may not adequately result in a stable, revegetated landscape. The geochemical composition of tailings and waste rock facilities may not support native vegetation. Soils are nonrenewable resources. Damage, disturbance, and removal of the soil resource may result in a loss of soil productivity, physical structure, and ecological function across the proposed mine site and across downgradient lands. The mining area could potentially act as a barrier to sourcing and supporting natural downslope transportation of geological material, water, and nutrients through alluvial, eolian, and fluvial processes.

Issue 1 Factors for Alternative Comparison

1. Qualitative assessment of long-term stability of tailings and waste rock facilities, including expected results of reclamation
2. Acres and quantitative level of disturbance leading to lost soil productivity
3. Qualitative assessment of the potential for revegetation of tailings and waste rock facilities
4. Qualitative evaluation of alteration of soil productivity and soil development
5. Tons per year of sediment delivery to Davidson Canyon, Cienega Creek, or other streams and washes, compared with background sediment loading

Issue 2: Impact on Air Quality

Changes in air quality that could potentially occur from the mine operation were identified as a significant issue. Construction, mining, and reclamation activities at the mine and along transportation and utility corridors would increase dust, airborne chemicals, and transportation related (mobile) emissions in the affected area. The Clean Air Act and other laws, regulations, policies, and plans set thresholds for air quality, including Class I airsheds.

The emission of greenhouse gases has been implicated in global climate change, and the policy of the Federal Government is to reduce these emissions when possible (Executive Order 13514). Greenhouse gases are those in the atmosphere that retain heat. They are natural and keep the earth from becoming too cold. The specific gases known as greenhouse gases are carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), and fluorocarbons. CH_4 , N_2O , and fluorinated gases would be emitted by the project; however, the anticipated level of emissions of these gases is much smaller than the level of CO_2 emissions associated with the project.

Issue 2 Factors for Alternative Comparison

1. Particulate emission estimates, compared with background and threshold (particulate matter less than or equal to 2.5 microns in diameter ($\text{PM}_{2.5}$) and particulate matter less than or equal to 10 microns in diameter (PM_{10}))
2. Greenhouse gas emission estimates, compared with background (tons) during premining, active mining, and final reclamation and closure phases
3. Volatile organic compound (VOC) and nitrogen oxide (NO_x) emissions and emissions rates to air
4. Quantitative assessment of the ability to meet air quality standards
5. Qualitative assessment of the potential for degradation to Class I airsheds

Issue 3: Impact on Water Resources

This group of issues relates to the effects during premining, active mining, final reclamation and closure, and postmining phases on the quality and quantity of water for beneficial uses, wells, and stock watering. The loss of water available to riparian and other plant and animal habitat is addressed in Issues 4 and 5.

Issue 3A: East Side Groundwater Availability

The proposed open-pit mine may reduce groundwater availability to private and public wells in the vicinity of the open pit. Household water availability could potentially be reduced.

Issue 3A Factors for Alternative Comparison

1. Direction and feet of change in water table level, including annual average, range, and rate, compared with background
2. Impairment of mountain-front groundwater recharge function
3. Geographic extent in which water resources may be impacted
4. Duration of the effect (in years)
5. Comparison of mine pit water loss by evaporation with overall basin water balance
6. Potential reduction in subsurface groundwater outflow from Davidson Canyon to Cienega Creek
7. Approximate number of wells within the geographic extent of the impact

Issue 3B: West Side Groundwater Availability

Water needed to run the mine facility could reduce groundwater availability to private and public wells in the Santa Cruz Valley, specifically the communities of Sahuarita and Green Valley, Arizona. Household water availability could potentially be reduced.

Issue 3B Factors for Alternative Comparison

1. Water needed for operations from the Santa Cruz Valley and comparison with other water uses and basin water balance, measured in acre-feet
2. Direction and feet of change in water table level, including annual average and range and rate, compared with background
3. Geographic extent in which water resources may be impacted
4. Duration of the effect (in years)
5. Potential for subsidence to occur as a result of groundwater withdrawal
6. Approximate number of wells within the geographic extent of the impact

Issue 3C: Groundwater Quality

Construction and operation of the mine pit, waste rock, and leach facilities have the potential to exceed Arizona Aquifer Water Quality Standards. The mine pit could result in the creation of a permanent pit lake, which has the potential to concentrate dissolved metals and toxins and may lower pH levels. Likewise, disposal of waste material in surface facilities such as tailings, waste rock, and leaching operations could potentially contribute to degradation of the aquifer.

Issue 3C Factors for Alternative Comparison

1. Ability to meet Arizona Aquifer Water Quality Standards at points of compliance designated in the aquifer protection permit
2. Ability to demonstrate best available demonstrated control technology⁸

Issue 3D: Surface Water Availability

Construction and operation of the mine pit, tailings, waste rock, and leach facilities have the potential to change surface water discharge to Davidson Canyon and Cienega Creek, portions of which are designated an Outstanding Arizona Water by the Arizona Department of Environmental Quality. Additionally, the availability of water for stock watering tanks could be reduced.

Issue 3D Factors for Alternative Comparison

1. Quantitative assessment of water released and available for beneficial uses, measured as percent reduction from baseline
2. Number of stream miles changed from intermittent/perennial flow status to ephemeral flow status as a result of the project

⁸ Use of best available demonstrated control technology is required by the aquifer protection permit. The purpose is to employ engineering controls, processes, operating methods, or other alternatives to reduce discharge of pollutants to the greatest degree achievable before they reach the aquifer. Refer to the “Groundwater Quality and Geochemistry” section in chapter 3 for further information.

3. Quantitative assessment of potential lowering of the water table/reduced groundwater flow to Davidson Canyon and Cienega Creek that results in permanent changes in flow patterns and that may affect their Outstanding Arizona Water⁹ designations and current designated uses
4. Number of stock watering tanks that would be unavailable
5. Change in volume, frequency, and magnitude of runoff from the project area
6. Change in recharge of the aquifer by runoff

Issue 3E: Surface Water Quality

Construction and operation of tailings, waste rock, and leach facilities have the potential to result in sediment or other pollutants reaching surface water and degrading water quality, leading to a loss of beneficial uses. If sediment enters streams, turbidity will increase, and State water quality standards could be exceeded. Downstream segments of Davidson Canyon and Cienega Creek are Outstanding Arizona Waters (Tier 3), which are given the highest level of antidegradation protection.

As outstanding resource waters under the ARS, Tier 3 waters must be maintained and protected, with no degradation in water quality allowed.

Issue 3E Factors for Alternative Comparison

1. Ability to meet Arizona Surface Water Quality Standards
2. Change in geomorphology and characteristics of downstream channels
3. Acres and locations that may be affected by surface water quality impacts and the duration (in years) of those impacts
4. Acres of potentially jurisdictional WUS impacted

Issue 4: Impact on Seeps, Springs, and Riparian Vegetation

Potential impacts on seeps, springs, and associated riparian vegetation could result from the alteration of surface and subsurface hydrology because of the pit and other operations. Potential impacts could include reduced or eliminated flow to seeps and springs and loss of, or change in, the function of riparian areas.

Issue 4 Factors for Alternative Comparison

1. Acres of riparian areas disturbed, by vegetation classification
2. Number of seeps and springs degraded or lost
3. Change in the function of riparian areas

⁹ The State of Arizona has the sole authority to make a determination about whether or not the proposed project would violate State water quality regulations by degrading Outstanding Arizona Waters. The person seeking authorization for a regulated discharge to a tributary to, or upstream of, an Outstanding Arizona Water (in this case Rosemont Copper) has the responsibility to demonstrate to the State of Arizona that the regulated discharge will not degrade existing water quality in the downstream Outstanding Arizona Water. This demonstration by Rosemont Copper, and determination by the State of Arizona, has not yet been completed. Independent of this determination, the potential for degradation of Outstanding Arizona Waters was raised by the public as an issue of importance, and therefore the Forest Service has the responsibility under NEPA to take a “hard look” at the potential for degradation. The analysis in this FEIS uses criteria developed by the Forest Service to assess this potential using available information; however, the State of Arizona would make their own determination using their own regulatory criteria and the information available to them at the time, which could differ from that used by the Forest Service.

4. Qualitative assessment of ability to meet legal and regulatory requirements for riparian areas¹⁰

Issue 5: Impact on Plants and Animals

This group of issues focuses on the effects on plant and animal populations and habitats. Many aspects of the mine operations have the potential to affect individuals, populations, and habitat for plants and animals, including special status species. This issue includes the potential for impacts on wildlife as a result of landscape alteration, and as a result of light, noise, vibration, traffic, and other disturbance from the proposed mine operations.

Issue 5A: Vegetation

The pit, plant, tailings and waste rock facilities, road and utility corridors, and other facilities have the potential to permanently change vegetation, and reclamation may not restore vegetation to preproject conditions.

Issue 5A Factor for Alternative Comparison

1. Acres of terrestrial vegetation permanently lost or altered, by vegetation type

Issue 5B: Habitat Loss

The mine and ancillary facilities could result in a loss or alteration of habitat for numerous plant and animal species. Potential impacts could impact upland and riparian habitat and fragmentation of riparian habitat and corridors, including Cienega Creek.

Issue 5B Factors for Alternative Comparison

1. Acres by type of terrestrial and aquatic habitat lost, altered, or indirectly impacted
2. Qualitative assessment of impacts on aquatic habitats and surface water that supports wildlife and plants such as stock tanks, seeps, and springs
3. Qualitative assessment of how changes in the function of riparian areas could impact wildlife habitat

Issue 5C: Nonnative Species

The mine and its operations have the potential to create conditions conducive to the introduction, establishment, and/or spread of nonnative species, which may out-compete native plants and animals. Forest Service and other Federal, State, and local laws, regulations, policies, and plans contain management direction for invasive plants.

Issue 5C Factor for Alternative Comparison

1. Acres of disturbance that could create conditions conducive for invasive species

¹⁰ This analysis reflects the criteria developed and analyzed by the Forest Service, which will differ from those used by the State of Arizona to make their determination of the ability of the proposed project to meet regulatory requirements.

Issue 5D: Wildlife Movement

The mine and its operations could potentially modify and/or fragment wildlife habitats and/or reduce connectivity between habitats. Increased traffic could correspondingly increase wildlife mortality and injury.

Issue 5D Factors for Alternative Comparison

1. Qualitative assessment of the change in movement corridors and connectivity between wildlife habitats
2. Qualitative assessment of mortality of various animal species resulting from increased volume of traffic related to mine operations

Issue 5E: Special Status Species

The mine and its operations have the potential to impact habitat for special status species (see the “Analysis Methodology, Assumptions, Uncertain and Unknown Information” part of the “Biological Resources” section in chapter 3 for a description of special status species).

Issue 5E Factors for Alternative Comparison

1. Acres of habitat disturbed for each special status species, including impacts to designated and proposed critical habitat
2. Potential to affect the population viability of any species

Issue 5F: Animal Behavior

Mine construction, closure, and operations, including drilling and blasting, may result in noise and vibrations, which could impact animal behavior and result in negative impacts on wildlife. Nocturnal and other animals may be adversely affected by the light glow in night skies.

Issue 5F Factors for Alternative Comparison

1. Acres of habitat impacted from noise, vibration, and light
2. Qualitative assessment of effects on wildlife behavior from noise, vibration, and light

Issue 6: Impact on Cultural Resources

This group of issues focuses on the adverse effects of the proposed mine operations on cultural resources. Mine operations could impact historic properties as well as traditional uses and perceptions of the land for the many communities who have used it over the past centuries. Native Americans claim the area as part of their ancestral homelands. Tribes consulted as part of the EIS process perceive disruption of the physical world as causing spiritual harm to the Earth and to the people here. Ancestral human remains and sacred sites are known to exist in the project area, as are traditional resource collecting areas.

Ranching and mining communities also have attachments to the area that began in the late 19th century and continue through the present. Comments submitted during public scoping identified impacts on the historic rural landscape as an issue, as well as impacts on traditional resource

collecting areas and recreation venues. Historic human burials may yet be found in areas not excavated during previous archaeological investigations.

Issue 6A: Impacts on Historic Properties

Proposed mine activities, from premining through final reclamation and closure, would bury, remove, or damage historic properties, including traditional cultural properties, sacred sites, traditional use areas, archaeological sites, historical structures, districts, and landscapes. Vibrations from blasting and drilling could damage historical structures in the immediate and adjacent areas. This could also result in the loss of or reduction in the future research and public interpretation potential of known and yet-to-be-discovered sites, along with the permanent alteration of cultural landscapes important to the ongoing cultural practices of Native American tribes and other communities with cultural or historic ties to the project area.

Issue 6A Factors for Alternative Comparison

1. Number of National Register of Historic Places eligible historic properties, including traditional cultural properties, sacred sites, and other landscape-scale properties, buried, destroyed, or damaged
2. Potential for vibrations to damage historic structures in adjacent areas
3. Qualitative assessment of impacts on historic properties

Issue 6B: Disturbance of Human Remains

Human remains have been discovered in previous archaeological excavations of prehistoric and historical sites in the Rosemont area. Additional burials are present in previously excavated and unexcavated historic properties and may be present in as-yet-undetected historic properties. Proposed mine activities, from premining through final reclamation and closure, have the potential to disturb human remains. Native American remains on Federal lands fall under the jurisdiction of the Native American Graves Protection and Repatriation Act (25 U.S.C. 3001); nonnative remains on Federal lands fall under the Advisory Council's "Policy on Burial Sites, Human Remains and Funerary Objects on Federal Lands" (February 23, 2007). Arizona burial laws (ARS 41-844 and 41-865) protect human remains on State and private lands.

Issue 6B Factors for Alternative Comparison

1. Number of impacted prehistoric sites known/likely to have human remains
2. Number of historic period sites likely to have human remains

Issue 6C: Sacred Sites

Several Federal laws direct Federal land management agencies, to the extent permitted by law and not clearly inconsistent with essential agency functions, to accommodate access to and use of Native American sacred sites, to avoid affecting the physical integrity of such sites wherever possible, and to temporarily close NFS land for traditional and cultural purposes. Tribal consultation has identified springs, high vision points, and many natural resources in the project area as having sacred ceremonial functions. Proposed mine activities, from premining through final reclamation and closure, could preclude access to or destroy or degrade these types of resources.

Issue 6C Factors for Alternative Comparison

1. Number of sacred springs impacted
2. Qualitative assessment of the impacts on Native Americans of desecration of land, springs, burials, and sacred sites

Issue 6D: Traditional Resource Collecting Areas

Native Americans and the ranching, mining, and Mexican American communities use the Rosemont area to collect and process natural resources for food, medicines, firewood, and traditional crafts. Proposed mine activities, from premining through final reclamation and closure, could preclude access to or destroy or degrade these types of resources.

Issue 6D Factors for Alternative Comparison

1. Acres of traditional resource collection areas impacted
2. Qualitative assessment of the impacts on other non-tribal communities in the region in terms of impacts on resources, such as historical townsites, cemeteries, mines, ranches, and homesteads

Issue 7: Impact on Visual Resources

This issue focuses on the visual impacts that would result from the proposed mine pit, placement of tailings and waste rock facilities, and development and use of other facilities. The proposed mine tailings and waste rock facilities would create significant changes to the landscape. The facilities may block valued mountain views. The processing plant, roads, and utility corridor could also affect visual resources in the area. The character of the SR 83 designated scenic corridor and the views from it may change. The ability for the area to meet assigned scenic integrity objectives in the forest plan could potentially be reduced. The scenic quality of the landscape may be permanently degraded.

Issue 7 Factors for Alternative Comparison

1. Acres that would no longer meet current forest plan scenic integrity objectives designations
2. Qualitative assessment/degree of change in landscape character from analysis viewpoints over time
3. Miles of SR 83 with direct line-of-sight views of the project area
4. Miles of project area visibility along concern level 1 and 2 roads and trails

Issue 8: Impact on Dark Skies and Astronomy

This issue relates to the potential for the mine operation and facilities to reduce night sky visibility. Many area residents, recreationists, research and amateur astronomers, and stargazers value the current dark skies in the area. Increased light and air particulates from mine related facilities, equipment, vehicles, and processes have the potential to diminish dark skies. The increased sky glow could reduce the visibility of celestial objects, particularly the faint ones, which are often the subject of scientific study. Key observation points and the Smithsonian Institution's Fred Lawrence Whipple Observatory could be adversely affected.

Issue 8 Factor for Alternative Comparison

1. Increase in sky brightness resulting from mine facility and vehicle lighting

Issue 9: Impact on Recreation

This issue focuses on the effects of the mine operation on recreation on NFS land, including loss of access and recreation opportunities and loss of or reduction in solitude, remoteness, rural setting, and quiet. The mine may lead to permanent changes to recreation settings (Recreation Opportunity Spectrum) and/or the type of recreation available and may result in increased pressure on public and private lands in other places to compensate for lost opportunities.

Issue 9 Factors for Alternative Comparison

1. Acres that would no longer meet current forest plan Recreation Opportunity Spectrum designations
2. Acres of the Coronado National Forest that would be unavailable for recreational use and miles of NFS roads lost
3. Qualitative assessment of potential for noise to reach recreation areas, i.e., audio “footprint”
4. Qualitative assessment of impacts on solitude in designated wilderness and other backcountry areas
5. Hunter-days lost (quantity based on number of permits available and number of days in season)
6. Miles of Arizona National Scenic Trail relocated
7. Qualitative assessment of increased pressure on other areas, including roads and trails/trailheads

Issue 10: Impact on Public Health and Safety

This issue focuses on the hazardous materials that would be transported and the potential increase in the risk of a spill or other public safety impact. Furthermore, an increase in traffic could reduce public safety by increasing the potential for traffic accidents. Another aspect of this issue is human health risks to forest visitors if they inadvertently come into contact with mine operations, tailings facilities, or waste rock facilities. Air quality impacts resulting from the operation could potentially be harmful to public health.

Issue 10 Factors for Alternative Comparison

1. Qualitative assessment of public health risk from mine operations and facilities
2. Qualitative assessment of public health risk from geological hazards
3. Qualitative assessment of public health risk from noise and vibration
4. Quantitative assessment of ability to meet air quality standards for human health
5. Quantitative assessment of the potential change in traffic accidents
6. Trip count per day for all hazardous materials and qualitative assessment of potential effects
7. Qualitative assessment of impacts on local emergency response to accidents or spills on public roadways

Issue 11: Impacts on Social and Economic Resources

Mine operation could have both negative and positive socioeconomic impacts that could change over time. The socioeconomic stability of the area could be affected. Residents', business owners', and visitors' expectations of national forests and the historic rural landscape may not be met.

Issue 11A: Regional Socioeconomics

The mine facilities and operation may result in changes over time to local employment, property values, tax base, tourism revenue, and demand and cost for road maintenance and emergency services. There may be costs to the alternative elements and mitigation measures that influence the present net value of the mine operations and, thus, its economic profile.

Issue 11A Factors for Alternative Comparison

1. Change in employment over time
2. Change in property values over time
3. Change in tax base per year over time
4. Change in demand and cost for State road maintenance over time
5. Change in demand and cost for emergency services over time
6. Quantitative assessment of change in tourism and recreation revenue over time
7. Qualitative assessment of economic effect on the astronomy industry

Issue 11B: Rural Landscapes

The mine operation may not conform to the quality of life expectations as expressed by the forest plan and Federal, State, and local regulations and ordinances. Commenters expressed concerns about modification of rural historic landscapes and local ranching traditions, which are important to local residents and visitors. Commenters also expressed a need to assess impacts on quality of life, including the economic nature of these rural landscapes.

Issue 11B Factors for Alternative Comparison

1. Qualitative assessment of the ability to meet rural landscape expectations as expressed by Federal, State, and local plans
2. Quantitative assessment of economic effects on amenity-based relocation

Issue 12: Impact on Transportation/Access

This issue focuses on the impact of increased mine related traffic during premining, active mining, and final reclamation and closure. Transportation of personnel, equipment, supplies, oversize permitted loads, and materials related to the mine operation has the potential to increase traffic. The operations also have the potential to permanently decommission forest roads or temporarily restrict access to forest roads and lands.

Issue 12 Factors for Alternative Comparison

1. Change in type and pattern of traffic by road and vehicle type
2. Quantitative assessment of the change in level of service on potential highway routes
3. Quantitative assessment of roads decommissioned by the mine and roads lost to motorized access

Chapter 2. Alternatives, Including the Proposed Action

Introduction

This chapter describes and compares the alternatives considered in detail for the project. It also discusses how these alternatives respond to the purpose of and need for action and address the significant issues presented in chapter 1. The alternatives considered in detail represent a range of possible actions that respond to the significant issues, purpose and need, and Federal and State laws and regulations. The U.S. Army Corps of Engineers (USACE) has considered a range of alternatives that includes the alternatives considered in detail in this final environmental impact statement (FEIS); refer to appendix A, “U.S. Army Corps of Engineers’ Section 404(b)(1) Alternatives Analysis.”

For the purposes of this FEIS, the term “project area” refers to an area that is composed of the open pit, waste rock facility, tailings facility, heap leach facility, plant site and ancillary facilities, fenced area around the mine (perimeter fence), and mine primary access road. Unless specifically noted, the term “project area” does not include the linear water and electricity utility corridors. The project area is shown on a number of maps throughout chapter 3.

The term “analysis area” is specific to each resource and is explicitly defined in each resource section of chapter 3. The analysis area includes all areas necessary to adequately assess impacts to resources and often includes areas beyond the project area, including utility corridors.

Changes from the Draft Environmental Impact Statement

The U.S. Forest Service (Forest Service) received numerous public and agency comments about the content of chapter 2 of the draft environmental impact statement (DEIS). Some asked that the range of alternatives evaluated in the FEIS be expanded or revised to better address resource concerns and/or to better disclose differences between the alternatives. In response to these comments, the descriptions of some alternatives have been modified. Others have changed as a result of the continuing refinement of their design by Rosemont Copper Company (Rosemont Copper), some refinements of which were requested by the Forest Service. However, no additional alternatives have been proposed or evaluated in the FEIS.

Several comments stated that the no action alternative reflected a “static” condition and needed to better reflect trends such as climate change, increasing population, and development and use of public land. In response, the description of the no action alternative was expanded in the FEIS to mention these trends and uses, and the impacts analysis in chapter 3 was modified, where necessary, to account for the effects that may result from future conditions.

A range of comments brought attention to roads near the project area, including concerns about access for recreational and ranching use. This drove the Coronado National Forest (the Coronado) to gain and provide a better understanding of what would happen to the area roads and explore possibilities to link existing roads for better area access. Therefore, a number of new road segments have been added to the analysis, as well as other roads that are proposed to be decommissioned. Although this has added acres to the direct impacts calculations from the DEIS, it has provided a better understanding of the area roads (as described below within the alternative descriptions), as well as addressing some of the public access issues (as described in the “Recreation and Wilderness” resource section of chapter 3).

Other comments requested that some alternative components—many of which were considered but eliminated from further analysis in the DEIS—be addressed in the analysis and that the rationale for eliminating alternatives from detailed consideration be more clearly explained. In response, suggestions were further reviewed, including partial and full backfill of the pit, and the “Alternatives Considered but Eliminated from Detailed Study” section was updated.

Some comments requested that additional mitigation and monitoring be developed and required for a variety of resources. In response, the “Mitigation and Monitoring” section of chapter 2 has been updated, and an appendix has been added that contains a more detailed mitigation and monitoring plan.

Many comments, including those offered by the U.S. Environmental Protection Agency (EPA), asked that the FEIS include additional details about financial assurance (i.e., reclamation bonding) and that bond calculations be included in the FEIS. It is Forest Service policy to calculate bond amounts only after approval of the record of decision (ROD) but before approval of the final mine plan of operations (MPO). Therefore, final bond calculations are not included in this FEIS. As a practical matter, reclamation costs cannot be accurately estimated until an alternative with associated mitigation is selected. However, the “Financial Assurance” section of this chapter has been expanded to better describe the bonding and bond calculation process by the Coronado and USACE.

Several comments expressed concern about the necessity and appropriateness of amending the “Coronado National Forest Land and Resource Management Plan,” as amended (forest plan) (U.S. Forest Service 1986), for this project and questioned the nonsignificant determination for the amendment. The amendment process and significance determination were reviewed in light of applicable direction and regulation. The review determined that no substantial changes to the process or determination were needed.

Additional changes to this chapter include the following refinements and technical updates:

- Additional details and refinements to the description of the Barrel Alternative, including the exclusion of the oxide processing facilities and the heap leach; consideration of “landforming”/geomorphic reclamation;¹ and stormwater design improvements (further explanation below);
- The “General Overview of Mining Activities” section has been updated to reflect Rosemont Copper’s revisions to planned activities and design since the DEIS was released, including details now available in the aquifer protection permit and air quality permit;
- Integration and explanation of mine life and production schedules and how they pertain to various alternatives;
- A discussion of the Arizona Corporation Commission (ACC) decision about electrical line location;
- A discussion of an updated mitigation plan regarding reducing the effects of lighting;
- Refinements to the plant site description for specific alternatives for conservation of a Forest Service sensitive species; and
- Technical corrections, minor word changes, and reorganization to improve clarity.

Alternatives Considered in Detail

The Council on Environmental Quality (CEQ) states, “Reasonable alternatives include those that are practical or feasible from technical and economic standpoint and using common sense, rather than simply desirable from the standpoint of the applicant” (Council on Environmental Quality 2007:16). Further, each reasonable alternative must satisfy a project’s purpose and need as well as address significant issues identified during scoping.

In this FEIS, the proposed action, no action, and four additional action alternatives (i.e., Phased Tailings, Barrel, Barrel Trail, and Scholefield-McCleary) are evaluated. Each alternative was developed in accordance with Rosemont Copper’s preliminary MPO (WestLand Resources Inc. 2007a) and modified in response to issues raised by the public, the Coronado interdisciplinary team (ID team), tribal governments, Federal, State, and local agencies, and other interested organizations and parties.

The proposed action is derived from the preliminary MPO submitted by Rosemont Copper for approval, which was modified in response to Forest Service comments prior to its acceptance for environmental review. Description and consideration of the “No Action” alternative is required to be evaluated by CEQ regulations at 40 Code of Federal Regulations (CFR) 1502.14(d). No action (alternative 1) is the only alternative among the six that is consistent with management direction in the forest plan. A programmatic forest plan amendment must be approved for all others to change direction specific to the proposed project area, including plan components. (Refer to the “Forest Plan Consistency” section later in this chapter.)

The four other action alternatives were developed by the ID team after consideration of: (1) the purpose of and need for action; (2) the details of the proposed action (preliminary MPO); (3) how to address significant issues raised by the public during the 120-day scoping period (see chapter 1); and (4) additional alternatives suggested by the public and agencies during the scoping period. Scenarios that did not meet the purpose of and need for action, did not resolve environmental conflicts, and/or were not available or were not otherwise feasible were not carried forward for recommendation as alternatives. (See the “Alternatives Considered but Eliminated from Detailed Study” section.)

The other action alternatives differ from the proposed action in one or more of the following ways: location and/or configuration of tailings and waste rock facilities, locations for access roads, inclusion of oxide processing and associated facilities, and alternate process facility sites. They also may include modifications of the preliminary MPO related to the timing of tailings placement, various designs of stormwater control facilities based on different design storms, or the layout of stormwater diversion channels. As they were being developed for the DEIS, the four action alternatives were shared with Rosemont Copper to confirm that they were realistic and technically feasible. After minor modifications that addressed safety and stability considerations and ensured that the waste rock and tailings facilities had sufficient design capacity, the Forest Service presented four preliminary action alternatives to the cooperating agencies in this National Environmental Policy Act (NEPA) review. In response, several agencies offered constructive comments and recommended additional alternatives for consideration. This led to a collaborative effort among all agencies to reach consensus on a range of reasonable alternatives. In accordance with the Clean Water Act (CWA) guidelines at 40 CFR 230, the USACE concurred on the range of alternatives considered in detail in the DEIS, using the approach described in appendix A, “U.S. Army Corps of Engineers’ Section 404(b)(1) Alternatives Analysis” (WestLand Resources Inc. 2013b).

On May 10, 2010, the Forest Supervisor approved three alternatives to the proposed action (Phased Tailings, Barrel, and Scholefield-McCleary) for inclusion in the DEIS (Derby 2010). A fourth action alternative (Barrel Trail) was added to the DEIS after the proposal of a geomorphic reclamation approach to the Barrel Alternative.

Following release of the DEIS, the Coronado and Rosemont Copper continued to refine alternatives in response to agency and public comment, additional design and engineering, and feasibility considerations. One of the changes that resulted was removal of oxide ore processing and associated facilities from the Barrel Alternative. The following discussion provides the background for how this change came about and why the Forest Supervisor chose to remove this process and facilities from the Barrel Alternative.

Removal of Heap Leach Facility from Barrel Alternative

The DEIS for the Rosemont Copper Project included five action alternatives (the proposed MPO, or proposed action, and four alternatives), each that contain an open pit, plant site, tailings and waste rock facilities, and associated infrastructure. “Alternative 4 – Barrel Alternative” was identified in the DEIS as the preferred alternative.

After the DEIS was published, Coronado ID team members expressed concern that although “Alternative 5 – Barrel Trail Alternative” arose from the application of geomorphic design elements, the preferred alternative (Barrel) did not incorporate any geomorphic design elements (also known as “landforming”). These concerns were reinforced by public and agency comments on the DEIS, which expressed numerous concerns regarding impacts related to the mine footprint and design, including impacts to visual resources and reduction of stormwater flow downstream of the mine facility.

Application of geomorphic reclamation techniques was identified as potentially addressing concerns over both visual resources and stormwater flow. The Forest Supervisor directed that a process be undertaken to explore the application of geomorphic design concepts to the Barrel Alternative within certain specifications. The specifications included:

- The mine facility was to remain on the west side of State Route (SR) 83 in order to avoid impacts to the State highway and additional National Forest System (NFS) resources;
- Archaeological sites (specifically the “Ballcourt” site) were to be avoided;
- The Barrel Alternative footprint was not to be expanded in order to avoid additional impacts to habitat for wildlife and plants (including habitat for threatened, endangered and sensitive species), as well as waters of the United States (WUS); and
- For the purposes of water quality control, it was desirable to maintain the hydraulic sink associated with the mine pit lake (refer to the “Groundwater Quantity” and “Groundwater Quality and Geochemistry” resource sections in chapter 3).

This process was undertaken by members of the Coronado ID team, along with their consultants. Resource specialists, including visual resource specialists, engineers, and hydrologists, participated, as well as contract experts in geotechnical engineering and geomorphic reclamation (SWCA Environmental Consultants 2013g).

The Coronado ID team established a list of goals for any new design:

- Long-term stability, control of erosion, and low postclosure maintenance were desirable.

- Due to the desire to maintain the hydraulic sink, backfill of material into the pit was unable to be considered. Note that that pit backfill was fully assessed elsewhere for viability (see the “Alternatives Considered but Eliminated from Further Study” in chapter 2 and supporting documentation in the project record).
- Based on concerns raised by the public and cooperating agencies (including the EPA and USACE), the ID team determined that it was important to route as much surface water downstream to Davidson Canyon as practicable. In particular, it was determined that postclosure no water should be stored on the top or benches of the waste rock/tailings facility, not only to allow that water to proceed downstream but to reduce the potential for infiltration of stormwater into the waste rock facility.
- In order to minimize potential long-term maintenance issues, the ID team determined it was desirable to remove underdrains if feasible.
- As noted, one of the reasons that investigation of geomorphic reclamation was undertaken was the concern over impacts to visual resources. While mitigating visual impacts was desirable across the entire landform, the ID team focused on visual concerns regarding the portion of the landform most visible from SR 83, Sonoita, and recreationists on the Coronado National Forest. It was determined that visual mitigation was most desirable on the east side of the landform, and was less critical on the west (pit) side of landform. Visual mitigation concepts considered included reducing the number of benches and applying more natural-looking contours to the profile (as opposed to flat tops like many tailings facilities).

An iterative ID team review process resulted in three potential design refinements for the Barrel Alternative, each achieving the same goals to greater or lesser extent. In May 2012, the Forest Supervisor selected one of the refined designs to be incorporated for analysis into the Barrel Alternative.

Rosemont Copper’s engineering and design team worked with the Coronado and their consultants throughout the process described above, in order to provide recommendations to the Forest Supervisor regarding both the technical and financial feasibility of refined designs. In June and July 2012, Rosemont Copper undertook preparation of detailed stacking and engineering plans in order to fully vet the selected design. On July 10, 2012, Rosemont Copper informed the Forest Supervisor that “the operational sequencing required under this alternative does not allow Rosemont sufficient time to complete the leaching process and fully recover the copper from the oxide ore materials” (Rosemont Copper Company 2012h). After reviewing the refined design of the Barrel Alternative and public and agency comments on the DEIS, Rosemont Copper informed the Forest Supervisor that both the heap leach and underdrains would need to be removed from the refined Barrel Alternative design and that doing so for the Barrel Alternative would be: (1) both technically and financially feasible, though not optimal; and (2) acceptable to the proponent. In doing so, Rosemont Copper proposed to the Coronado that the heap leach processing and associated facilities be removed from the Barrel Alternative.

The Forest Supervisor considered the refined design for the Barrel Alternative in light of Rosemont Copper’s suggested removal of the heap leach. It is important to note that the Forest Supervisor does not have the legal authority to require Rosemont Copper to forgo any of their mineral recovery, as described in chapter 1, as long as applicable laws and regulations can be met. While NEPA allows the consideration of reasonable alternatives that are outside the jurisdiction of the lead agency, such conflicts must be considered. The Forest Supervisor considered whether to apply removal of the heap leach process and facilities to any additional alternatives and determined that application to only the

Barrel Alternative would accomplish several goals. First, the Forest Supervisor recognized that this as an opportunity to reduce impacts, respond to public and agency comments, and reduce the need for long-term maintenance of a heap leach facility that could affect NFS surface resources and groundwater quality. Secondly, by applying it only to the Barrel Alternative, it would help in more “sharply defining the issues and providing a clear basis for choice among options by the decision maker and the public” (40 CFR 1502.14). Lastly, as the analysis of environmental impacts proceeded, the Forest Supervisor had the opportunity to direct that the heap leach process and facilities be removed from additional alternatives, if it proved beneficial in fostering a better decision.

The Forest Supervisor ultimately decided to modify the Barrel Alternative by removing the heap leach processing facility as well as the underdrains from the Barrel Alternative, as proposed by Rosemont Copper, and retaining the refinements to the Barrel Alternative design that arose out of the Coronado ID team’s geomorphic reclamation process (i.e., modified stormwater structures, fewer benches, contouring and shaping of the benches and upper portion of the landform).

Applicability of Heap Leach Facility Removal to Other Alternatives

The removal of the heap leach facility and underdrains was the outcome of a process intended to investigate improvements with respect to impacts to both visual and water resources, as well as reduce long-term maintenance concerns involving the action alternatives.

In response to inquiries from the Forest Supervisor regarding removal of the heap leach from the Barrel Alternative only, Rosemont Copper provided further explanation of the applicability of removing the heap leach facility from other alternatives: “The logistics associated with other alternatives allow for unimpeded operation of the leach facility for a much longer period of time, and hence, full leaching of the oxide material could occur. Consequently, under the other alternatives, our ability to recover metals through the leaching process is not compromised” (Rosemont Copper Company 2012c).

The Forest Supervisor decided that refinements to incorporate improved stormwater management and geomorphic design elements would not be undertaken for the other action alternatives. Alternative development through the NEPA process encourages evaluating a range of alternatives to demonstrate the tradeoffs that are analyzed. Forest Service Handbook 1909.15, Chapter 10, Section 14.3, states, “Modifications and incremental changes to the alternatives may be considered as part of the range of alternatives” (U.S. Forest Service 2012b). The application of the alterations to the Barrel Alternative helped to provide a range of alternatives for evaluation and decision. If any of the other alternatives were selected as the preferred alternative, the Forest Supervisor would be able to direct that refinements be explored to those alternatives similar to those undertaken for the Barrel Alternative, provided those refinements remained technically and financially feasible.

General Overview of Mining Operations

The discussion of mine operations in this section applies to the proposed action and all action alternatives (alternatives 2 through 6) except where specifically noted. A complete description of the proposed action is found in Rosemont Copper’s preliminary MPO (WestLand Resources Inc. 2007a) and in numerous technical documents, plans, and memoranda prepared by Rosemont Copper and its consultants in support of the preliminary MPO.

The project facilities described would be constructed for all action alternatives; however, the location and detailed design may vary by alternative. The exceptions are the mine pit and plant site, which have the same general location for all action alternatives, and the heap leach pads, which have the same location and shape for all alternatives except the Barrel Alternative, in which they are no longer included. Maps depicting key elements for each alternative are provided as part of the alternative descriptions. A more detailed description of each of the alternatives, including no action, follows this general overview.

Mine Facilities and Activities

The mine pit is where blasting and drilling activities would occur. The waste rock and tailings would be transported from the mine pit and processed within the corresponding facilities. A perimeter fence and security fence would be built to encompass the primary mining and processing operations and facilities, excluding portions of the access roads and utility lines. Further information is provided under the “Perimeter and Security Fences” section of this chapter.

Pit

Preproduction stripping of overlying rock would require 18 to 24 months to prepare for full-scale mining operations, train work crews, construct access and haul roads, and clear and grub the pit and tailings and waste rock facilities that would be disturbed during the initial years of operation. Open-pit mining would be used to excavate ore to recover copper, molybdenum, and silver. The roughly circular open-pit mine would measure, at end of mine life, between 6,000 and 6,500 feet in diameter, with a final depth of up to 3,000 feet (3,050 feet above mean sea level), depending on the elevation of the pit rim. Pit slope angles between in-pit roads would be controlled by rock strength and would range between 33 and 50 degrees. The pit would disturb about 955 acres, of which 590 acres would be on private land and 365 acres would be on NFS lands.

Rosemont Copper has submitted a number of pit outlines to the Coronado within various reports. Rosemont Copper has also updated its feasibility studies, and there has been some confusion regarding whether placement and surface area of the pit have been changed. The final pit specifications that are analyzed in this EIS were determined by the decision maker (Polm 2012). The surface outline as submitted for the initial MPO was chosen because it depicts greater surface disturbance than that of the most recent 2012 feasibility study (M3 Engineering and Technology Corporation 2012). However, the pit depth used in the analysis is at the ultimate elevation of 3,050 feet, as described in the 2009 feasibility study (Huss 2009) and in the water modeling described in the surface and groundwater resource sections of chapter 3. The pit bottom elevation of 3,050 feet was chosen for analysis because it depicts the greatest depth of disturbance, compared with the elevation of 3,150 feet originally submitted in the proposed action.

The most recent feasibility study also states that “the ultimate pit is currently under-optimized because of the capacity limitations of the tailings storage facility” (M3 Engineering and Technology Corporation 2012:117). Essentially, this means that when Rosemont Copper has reached the ultimate pit depth of 3,050 feet above mean sea level, removal of additional ore—which is present and economically feasible to mine—would be constrained because of the volume limitations of tailings and waste rock facility designs and footprints. Some concerns were raised with the Coronado that the most recent feasibility study implied that Rosemont Copper intended to mine deeper than the 3,050-foot elevation that was the basis for analysis in the FEIS. The Forest Supervisor requested clarification on this issue and received further information from Rosemont Copper: “At this time and

with the information we have currently, Rosemont has proposed an ultimate pit elevation of 3050 feet above mean sea level. . . . The modeling shown in the 2012 Feasibility study provides a good indication of the potential of the Rosemont deposit but this document should not be used to infer any changes to the operations proposed” (Rosemont Copper Company 2012e).

Blasting and Drilling

Explosives storage, transport, and use would adhere to all rules, regulations, and safety standards. Once a day on average, an ammonium nitrate and fuel oil explosive would be detonated in the mine pit. This would occur during daylight hours only, generally between 9 a.m. and 4 p.m. Dry bulk ammonium nitrate would be transported for use from storage silos at the adjacent plant site. Blasting detonators, such as caps, delays, cord, and boosters, would be stored in special magazines and transported to the pit in separate vehicles. If wet-hole blasting is necessary, an emulsion and/or slurry would be transported to the pit from onsite storage tanks. Mixed ammonium nitrate and fuel oil would be loaded and transported using special trucks designed for that purpose.

Ore and Ore Processing

The Rosemont deposit is primarily sulfide ore with a cap of oxide ore nearer the surface. The ore would be mined over 20 to 25 years at an average rate of 75,000 tons per day. Most of the oxide ore would be removed in the first 6 to 7 years of the project, while sulfide ore would be produced throughout the mine operation. Processing of the ore is different by alternative and is described below in each alternative section.

Over the past several years, Rosemont Copper has continued to drill and sample mineral resources on both private and NFS land to characterize the ore deposit and to refine its operation and facility design accordingly. This process is typical for mining operations. Additional drilling and analyses can change the level of certainty about the resource, with lower ranked material given a more certain classification. In order of level of certainty, “proven” has the greatest certainty, with decreasing certainty given to “probable,” “indicated,” and “inferred.” The terms relate to the certainty, as demonstrated by drill hole density and assay analysis of recovered core, of the tons and grade of the mineral resource. These terms are used in feasibility analyses and especially in the National Instrument 43-101 (used by the Canadian securities regulations for mining and mineral investments) to define the level of certainty attached to the ore grades. Further explanation and definitions are in appendix A.

A drilling campaign undertaken on private land in 2006, before the preliminary MPO was accepted by the Coronado, estimated, measured, and indicated mineral resources of 543 million tons of sulfide ore and 75 million tons of oxide ore. These mineral resources consist of proven and probable mineral reserves of nearly 493 million tons of sulfide and 49.5 million tons of oxide ores. There were also inferred resources (categorized as waste) of 163 million tons of sulfide and 30 million tons of oxide ores (M3 Engineering and Technology Corporation 2012).

Exploration on NFS lands prior to the preliminary MPO’s being accepted by the Coronado was approved in a NEPA decision in Forest Service (U.S. Forest Service 2008g) for minerals exploration actions. A 2008 drilling program, which occurred before the release of the DEIS, added 20 additional core holes to further define the northwestern part of the deposit and performed sampling and analysis on 10 previously drilled holes. The analysis resulted in estimated, measured, and indicated mineral resources of 562 million tons of sulfide ore and 103 million tons of oxide ore. Proven and probable mineral reserves of nearly 546 million tons of sulfide and 70 million tons of oxide ores were also

identified. There were inferred resources (still categorized as waste) of 180 million tons of sulfide and 30 million tons of oxide ores (Huss 2009).

A 2011 to 2012 drilling program that occurred before the release of this FEIS added 12 holes for the collection of metallurgical test samples, testing of geophysical targets, and additional core sampling (M3 Engineering and Technology Corporation 2012:27). The most recent analysis resulted in mineral resource and updated metallurgical test work being completed, with estimated, measured, and indicated mineral resources of 919.3 million tons of sulfide ore and 63.4 million tons of oxide ore. These mineral resources consist of proven and probable mineral reserves of nearly 667.2 million tons of sulfide. There were inferred resources of 138.6 million tons of sulfide and 1 million tons of oxide ores (Augusta Resource Corporation 2012). Because the latest feasibility study completed for the Barrel Alternative does not incorporate oxide ore processing (see the “Removal of Heap Leach Facility from Barrel Alternative” section of this chapter), a portion of the oxide ore (65 million tons) is instead categorized as waste rock.

Sulfide Ore Process

Sulfide ore would be sent through a circuit of crushers, grinding mills, and ball mills to reduce the rock size to the consistency of sand. A flotation circuit would separate the copper and molybdenum sulfides from the waste material to create a concentrate. The concentrates would then be dewatered, thickened, filtered, and loaded for shipment. The waste or tailings from the sulfide ore processing would be dewatered using large-capacity pressure filters, which would essentially squeeze the water out of the tailings to create a dry cake with a moisture content of 12 to 18 percent (AMEC Earth and Environmental Inc. 2009a). The filtered tailings would then be conveyed to and placed in the dry-stack tailings disposal facility, while the water would return to the process for recycled use (figure 2).

In all the action alternatives except the Barrel Alternative, some of the sulfide ore is “leachable” and would be processed along with the oxide ore, as described below. Rosemont Copper has not specified where smelting would occur, other than to state that it would not be in the United States due to capacity limitations.

Process Water Temporary Storage Pond

The process water temporary storage pond facility is a component of the sulfide ore process and would be regulated under the aquifer protection permit. The facility would be divided into two sections (ponds), termed the process water and the temporary storage ponds. In general, the reservoir in the process water pond would be managed to optimize containment of recirculated water, and the temporary storage pond would be kept at low fill levels to optimize room for stormwater runoff. Incline-mounted or barge pumps in each pond would pump captured recirculated process water and stormwater to the process circuit. The pumps would also allow each pond to be emptied for inspection.

Process water would be retained in a double-lined surface impoundment with a capacity of 70 million gallons, which would store 3 days of water reclaimed from the tailings filters and mixed with fresh water from Rosemont Copper’s supply wells near Sahuarita. Three days’ storage would allow for some flexibility and emergency storage in case of a service interruption at the plant facilities. Additionally, during operations, if ponded stormwater on the top surface of the dry-stack tailings facilities were to exceed timely evaporation, it would be pumped to the process water pond to limit infiltration to the tailings.

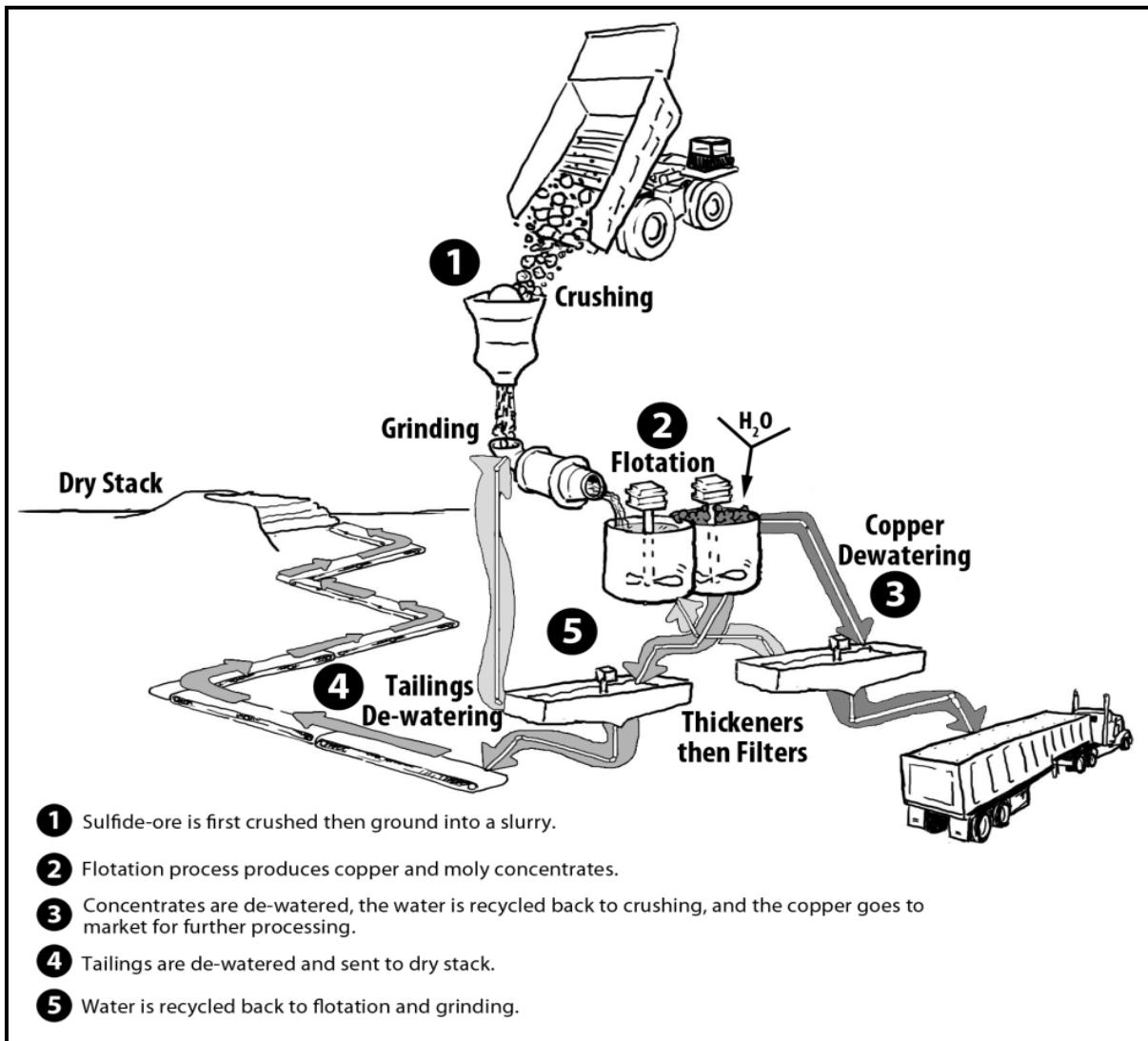


Figure 2. Sulfide ore processing; general schematic

The temporary storage portion would be a single-lined surface impoundment that would receive stormwater runoff from the plant site area, including a small drainage basin located west of the pond. As currently designed, the temporary storage portion would provide containment of a 100-year, 24-hour storm event. This pond would have a storage capacity of approximately 38 million gallons. Under the aquifer protection permit, this pond would need to be emptied of stormwater within 60 days.

Construction details for the process water temporary storage pond liners are discussed in the “Groundwater Quality and Geochemistry” resource section of chapter 3.

Oxide Ore Process

Oxide ore is located within the top portions of the proposed pit and is expected to be processed only within the first 6 to 7 years of the project. Oxide ore would be sent to a lined heap leach pad, where the ore would undergo a leaching process. Processing would include the placement of a system

similar to drip irrigation for the delivery of a weak solution of sulfuric acid, which would seep through the oxide ore heap and capture copper ions from the ore. The copper-laden pregnant leach solution would then be collected and routed to the solvent extraction and electrowinning facility for the production of high purity “cathode” copper plates (figure 3).

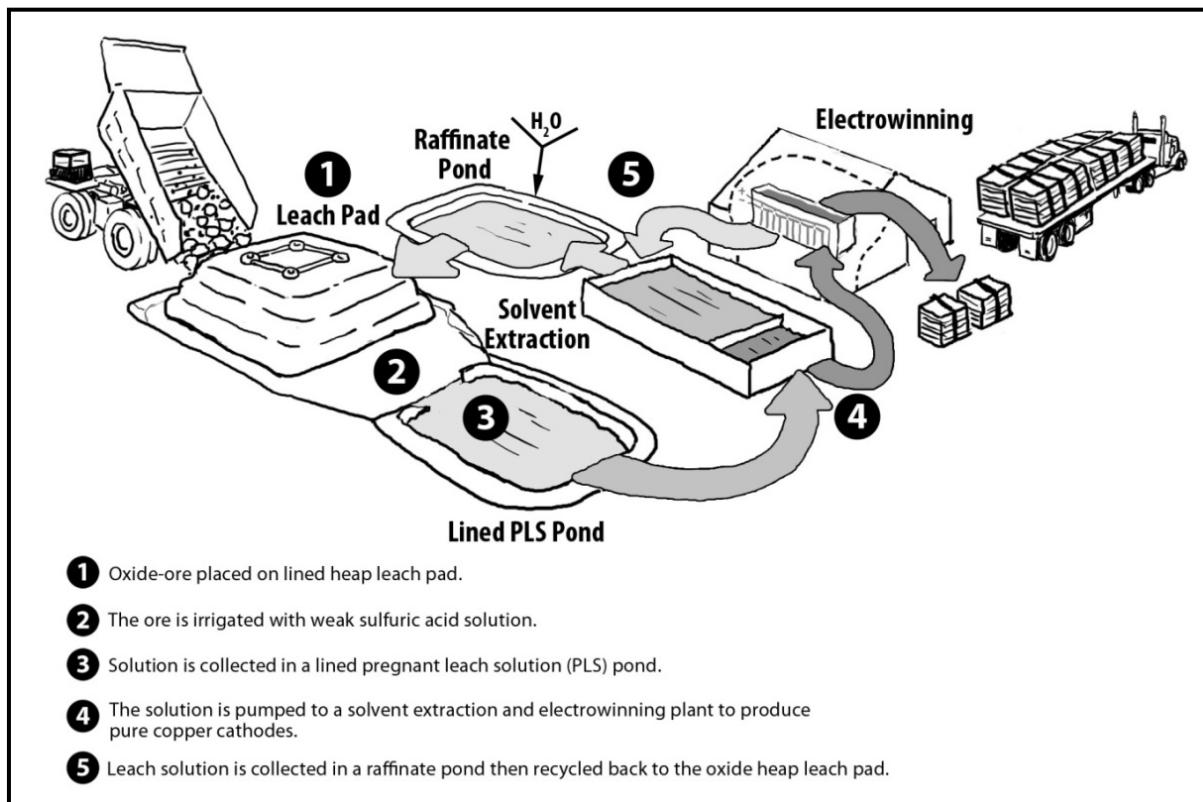


Figure 3. Oxide ore processing, general schematic

Once the oxide ore has been exhausted, the heap leach pad and ponds would be encapsulated within the waste rock facility. After encapsulation, residual drainage from the heap leach pad would be accessed via a concrete manhole to allow for a pump back system to remove treated water as part of water quality monitoring (Nelson 2012). It is important to note that this processing method is not used in the Barrel Alternative. In the Barrel Alternative, the oxide ore that has a high enough grade would be processed along with the sulfide ore, as previously described. The lower grade oxide ore would not be processed and would be disposed of as waste rock.

Below are descriptions of components of this process that are regulated facilities under the aquifer protection permit.

Heap Leach Pad

For all action alternatives except the Barrel Alternative, the lined heap leach pad would be constructed within the Barrel drainage. Oxide ore excavated from the pit would be placed on the heap leach pad in approximately 30-foot lifts to a maximum height of 450 feet above the liner. The pad would be lined with a 60-millimeter linear low-density polyethylene liner on top of a geosynthetic clay liner. Pregnant leach solution would drain via gravity from the pad by means of perforated drain pipelines that would route the solution to the pregnant leach solution pond (Arizona Department of

Environmental Quality 2012b). Construction details of the heap leach pad liner and treatment and monitoring system are discussed in the “Groundwater Quality and Geochemistry” resource section of chapter 3. Closure of the heap leach facility is also described in the “Groundwater Quality and Geochemistry” resource section of chapter 3.

Pregnant Leach Solution Pond

This is a double-lined surface impoundment with a storage capacity of approximately 23 million gallons.

Raffinate Pond

This is a double-lined surface impoundment that collects the barren solution from the solvent extraction and electrowinning plant after the copper has been removed and plated onto cathodes. The barren solution is acidified in this pond and then pumped to the top of the heap leach pad. This pond would have a storage capacity of approximately 4 million gallons.

Waste Rock and Tailings Placement

Waste rock would be placed in areas outside the open pit. Dewatered tailings would be sent via conveyor belt to the unlined dry-stack tailings disposal area, where they would be deposited, stacked, and compacted. Ultimately, the tailings would be encapsulated, or covered completely, by a thick layer of waste rock. Except for “Alternative 1 – No Action,” the different waste rock and tailings facility locations that are included with all action alternatives would allow Rosemont Copper to mine and process the minerals resource.

Ore, Waste Rock, and Tailings Transport

Transportation of ore, waste rock, and tailings would occur only in the mine area, which would be closed to the public for safety reasons. Ore and waste rock would be moved in large, off-highway haul trucks. Roads for the haul trucks would be constructed both within the open pit and between the pit and the plant, heap leach, and tailings and waste rock facilities. In accordance with Mine Safety and Health Administration (MSHA) regulations (30 CFR parts 1 to 199), haul roads would be approximately 125 feet wide, including safety berms and drainage ditches, and from 10 to 12 percent slope or less. Maximum truck speed would be 35 miles per hour. Haul roads would be temporary and would regularly be moved based on where materials are proposed to be placed. These temporary roads would be gradually covered by waste rock as it is placed. Any temporary haul roads remaining after all waste rock has been placed would be decommissioned unless the Coronado determined they were desirable for future management.

Sulfide ore would be transported from the pit to a crusher in mine haul trucks; following crushing, the sulfide ore would be transported via conveyors to the grinding and flotation unit. Dewatered tailings would be transported using a conveyor system from the dewatering plant to the tailings facility for final placement. The conveyors would transfer the tailings to a radial stacker, and then the tailings would be spread and compacted by a dozer. The compacted tailings would be encapsulated by a perimeter buttress formed of waste rock and a waste rock “cap” that would be placed by haul trucks traveling on haul roads.

Oxide ore would be transported in mine haul trucks from the pit and placed directly on the lined heap leach pad for processing for all alternatives except the Barrel Alternative.

Plant Site and Support Facilities

Facilities necessary to support the Rosemont Copper mining and ore processing operations include buildings and structures, such as administration buildings, change house, warehouse with laydown yards, analytical laboratory, light vehicle and process maintenance building, mine truck shop, mine truck wash and lube facility, powder magazines and ammonium nitrate storage, main guard shack with truck scale, and fuel and lubricant storage and dispensing facilities.

Lighting

The lighting plan proposed by Rosemont Copper before publication of the DEIS (M3 Engineering and Technology Corporation 2011) describes lighting elements, including the amount of lumens expected based on the use of legacy lighting systems, such as low- and high-pressure sodium lamps. Rosemont Copper has since submitted an updated lighting mitigation plan in response to comments expressing concern about impacts to dark skies and local astronomical interests (Monrad et al. 2012b). The original lighting plan remains a part of the proposed action, whereas the updated lighting mitigation plan applies to all other action alternatives.

The updated lighting mitigation plan describes and calculates expected lumens based on light emitting diode (LED) lighting, using both filtered and amber LED lamps. This plan mitigates the lighting system that was proposed in the preliminary MPO through its provisions for the following components:

- Full cut-off, solid-state LED lighting systems;
- High fitted target efficacy lighting systems and optics;
- Specific-purpose lighting systems with optics that match task requirements;
- Adaptive lighting controls to dim or extinguish lighting when not needed and to provide immediate “instant on” emergency or operational lighting;
- Where color rendering light is needed, use of color-tuned solid-state light sources for superior energy efficiency and optical control with attenuated short wavelengths to minimize Rayleigh scattering;
- Where color rendering light is not needed, use of narrow-band solid-state lighting to emulate low-pressure sodium but with superior optical and electrical control; and
- Color-adaptive lighting to shift from narrow-band amber emissions to higher color rendering light when color rendering is needed.

Under the updated lighting mitigation plan, all roadway and parking lot areas would use narrow-band LED lighting fixtures set 123 feet apart on two-lane haul roads and 225 feet apart on light-truck roads. The primary access road was not addressed in the initial design, but the amount of lumens was originally projected using only full cut-off low-pressure sodium fixtures.

Elevated hazard areas, such as the mine process area and pit, may require high-pressure sodium lighting or solid-state LED lighting fixtures that would be aimed and shielded to minimize light pollution. These fixtures would be located around the buildings in the process areas and concentrated around areas in the pit where large shovels are actively being operated. With a total of three shovels, three drills, and two loaders with various sized lamps, there would numerous beam-shaped LED fixtures that would direct more useful light to tasks. The only narrow-band lighting fixtures in this area would be used at a refueling site and explosives storage facility. Lighting on the leach pads

would be portable, may depend on ore processing schedules, and would be high-pressure sodium with shields.

According to the detailed site general electrical design that was based on the lighting plan proposed by Rosemont Copper before the DEIS, there would be a total of 12 200-watt and 475 90-watt low-pressure sodium fixtures, and there would be 19 200-watt, 86 90-watt, 11 70-watt, 21 50-watt, and 334 35-watt high-pressure sodium fixtures. Although the mitigation would implement different fixtures, it is not expected that the number of fixtures would decrease; instead, there would be a more focused lighting pattern.

Further discussion of the updated lighting mitigation plan is included in appendix B, “Mitigation and Monitoring Plan,” and in the “Dark Skies” resource section in chapter 3. Impacts associated with artificial night lighting are described in a variety of resource sections in chapter 3.

Solid, Hazardous, and Sanitary Waste

Solid waste would be recycled as appropriate and feasible. Nonrecyclable, nonhazardous waste would be disposed of at an onsite landfill located on about 2 acres of Rosemont Copper’s private land. Activities at the landfill will be regulated by the Arizona Department of Environmental Quality (ADEQ) aquifer protection permit for Rosemont Copper Mine facilities. Mine tire refuse would be disposed of within the waste rock storage facility, within the area under private landownership, according to Arizona Revised Statutes (ARS) § 44-1304(C) and Arizona Administrative Code (AAC), Title 18, Chapter 13, Article 12, “Waste Tires.”

The excavated depth of the landfill would range from 5 to 43 feet, with a minimum excavation elevation of approximately 5,190 feet above mean sea level; maximum height of the landfill at closure would be no more than 5,280 feet above mean sea level. All putrescent materials or other items that cannot be disposed there would be transported offsite for disposal by a commercial vendor. According to the Town of Sahuarita, this landfill would not be consistent with aspects of their general plan (Town of Sahuarita and General Plan Advisory Committee 2002). (Refer to the “Required Disclosures” section of chapter 3 for further information on local planning efforts.)

Hazardous waste would be handled and disposed of in accordance with Resource Conservation and Recovery Act regulations. The Resource Conservation and Recovery Act gives the EPA the authority to control hazardous waste from “cradle to grave.” This includes the generation, transportation, treatment, storage, and disposal of hazardous waste. The project would produce less than 220 pounds of hazardous waste each month and would qualify as a conditionally exempt small quantity generator. No hazardous waste would be disposed of onsite. All hazardous waste would be stored and then transported by licensed haulers for disposal at regulated facilities.

Sanitary waste would be treated in onsite septic systems, with leach fields located in the vicinity of each building. During the construction phase and where necessary during operations, portable toilets would be used in various locations throughout the plant and mine sites. The portable toilets would be serviced by a commercial sanitation company and the waste removed for disposal offsite.

Perimeter and Security Fences

A perimeter fence would be built to encompass the primary mining and processing operations and facilities, excluding portions of the access roads and utility lines. It would provide a zone restricted from public access and locations for environmental compliance monitoring. The fence would be

standard four-strand barbed wire, although the bottom wire would be bare, in accordance with Bureau of Land Management (BLM) and Arizona Game and Fish Department fencing standards. Access for fence construction would be by all-terrain vehicle or on horseback to avoid the need for a road. There would be signage on the perimeter fence stating that entrance into the project area is prohibited.

A security fence and security patrol road would be located within the perimeter fence, approximately 750 feet from the toe of the slope of the waste rock and tailings facilities. The road would be a one-lane gravel or native surface road used for patrols, fence maintenance, monitoring, and general mine related access. A guard shack would be located where the primary mine access road intersects the security fence. Near the guard shack, the fence would be chain-link and 6 feet high, with barbed wire along the top. Other areas farther away from the primary mine access road would be enclosed by a standard four-strand barbed wire fence to provide a secondary safety barrier, with signage to help ensure public safety and to provide access to aquifer protection permit points of compliance.

Depending on the location of the fencing, the fencing at the mine and facilities would remove NFS land from public use during the 24.5- to 30-year mine life. The configuration of the perimeter and security fences and security road varies by alternative and is depicted on maps of each alternative later in this chapter. Before project implementation, a legal closure order for the area within the perimeter fence would be issued by the Coronado, and notices would be posted along the fence.

The perimeter and security fences would be removed following closure after considering grazing and safety needs. The security road may be partially or completely reclaimed as part of mine closure and reclamation, depending on the need for postmine administrative access for maintenance or monitoring purposes. Portions of the site, including the mine pit, would likely remain fenced off and closed to the public indefinitely for safety reasons, or as required by the Arizona State Mine Inspector.

Ancillary Facilities and Activities

The discussion of facilities and activities in this section applies to all action alternatives, including the proposed action.

Utility Lines (Electrical and Water Supply)

On June 12, 2012, the ACC approved a Certificate of Environmental Compatibility (CEC) authorizing the construction of a 138-kilovolt (kV) electrical transmission line and associated facilities from the proposed Toro switchyard (located near Sahuarita) to the Rosemont substation (located at the mine). Because the water supply and utility maintenance road were intended to be co-located in all action alternatives in order to reduce impacts, the decision made by the ACC was instrumental in the final alignment of all three components (figure 4).

The development and identification of alternative routes for the Rosemont Copper 138-kV transmission line project was based on electrical system requirements and an environmental and public planning process conducted by Tucson Electric Power Company (TEP) from summer 2008 through spring 2011. This process included:

1. Environmental and engineering analyses;
2. Public participation and agency comments during the routing identification and selection process;

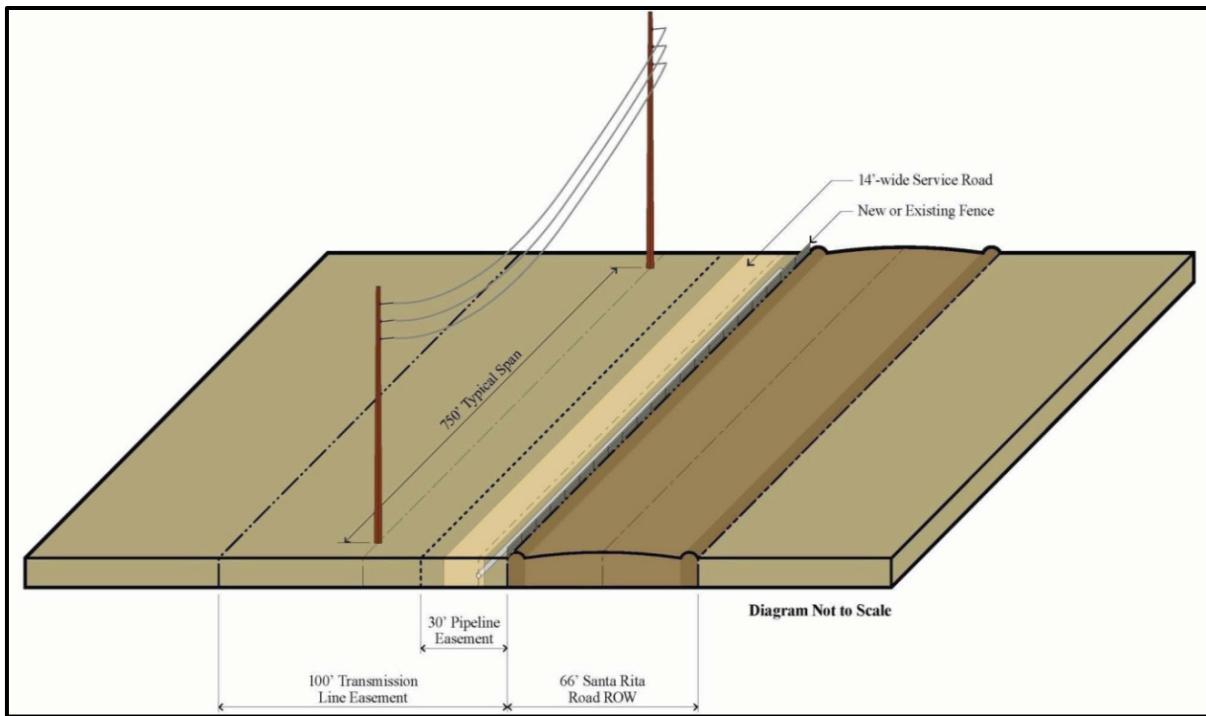


Figure 4. Typical transmission and pipeline easement (Tucson Electric Power Company 2011)

3. Application of line siting criteria to evaluate the compatibility of each alternative route; and
4. Hearings by the Line Siting Committee and the ACC.

Environmental studies included a review of land use, visual, biological, and cultural resource issues. Engineering studies included an evaluation of technical data to ensure continued reliability of the TEP transmission system, given the power demands of the Rosemont Copper Project, and a review of potential links for feasibility of construction. Consideration was given to each route's compatibility with established criteria for a CEC; consideration in the final route selection process was given by the Arizona Power Plant and Line Siting Committee and the ACC. Records pertaining to these planning efforts are filed with the ACC. A CEC from the ACC was granted on June 12, 2012 (Arizona Corporation Commission 2012b).

During mine closure, the power line would be removed from NFS land and disturbed areas reclaimed and revegetated with native vegetation. Removal of the power line on private and Arizona State Land Department (ASLD) land is outside the jurisdiction of the Forest Service. However, the CEC states that once service is no longer needed, "Applicant shall file a plan for removal of the transmission line" (Arizona Corporation Commission 2012b:3). This decision also states that all costs associated with the line removal would be charged to Rosemont Copper, and proof of funds for these costs is also required.

Power Supply

The total power requirement for the project is 108 to 112 megawatts (MW), which requires a minimum transmission voltage of 138 kV. The transmission line would be an aboveground single-circuit 138-kV nonreflective transmission line provided from a link attached to existing transmission

lines on the South substation loop. The transmission line would extend from the proposed Toro switchyard 13 miles to the proposed Rosemont substation, held on double-circuit capable Core 10 standard steel (rust-colored) monopole structures with typical heights of 75 to 150 feet. The route would generally parallel the existing South Santa Rita Road before entering private land held by Rosemont Copper (table 1). The alignment would then continue east over the ridge and cross the ridgeline at Lopez Pass (figure 5). The corridor width for the entire project route would be 500 feet and would include an associated 14-foot-wide unpaved maintenance road.

Table 1. Landownership or management of the utility corridor

	Forest Service	BLM	ASLD	Private
Electrical transmission line (feet)	2,787	0	47,881	18,393
Water supply line (feet)	5,079	0	65,881	32,849
Utility corridor (acres)	38	3*	574	302

* While the corridor for analysis includes some land within BLM jurisdiction, Rosemont Copper withdrew the BLM MPO and lands administered by the BLM would not be disturbed or otherwise affected by construction, maintenance or removal of utility facilities.

Power needed to operate the water pump stations (described below) would be supplied by an electrical line from the Rosemont substation, back over the same poles as the transmission line to the pump station buildings. The electrical line spanning pump stations two and three would be an underground line, at the request of ASLD.

In addition to traditional electrical service from TEP, Rosemont Copper plans to use solar technologies, such as passive solar installations, to power the administration buildings and potentially other areas.

Power Distribution Line Relocation

A 46-kV electrical distribution line that currently runs north-south through the project area would require realignment for each action alternative. Relocation would include the establishment of new electrical poles (similar to those found in residential areas) along the inside of the security fence where needed. The line would be strung on those poles and connected to the existing line.

No interruptions in service would be expected. Ground disturbance associated with relocation of this line would occur within the security fence perimeter, which is an area already considered disturbed for the purposes of the effects analysis; therefore, no additional ground disturbance would occur with this relocation.

Water Supply

During construction of the water supply pipeline, water would be drawn from existing wells in and around the project site in order to supply construction activities. It is estimated that approximately 600 to 900 gallons per minute would be necessary to support facility construction.

The project is permitted by the Arizona Department of Water Resources (ADWR) to draw up to 6,000 acre-feet¹¹ per year. However, it is currently estimated that the project would use between 4,700 and 5,400 acre-feet per year of fresh water, for a total use over the mine life of approximately 100,000 acre-feet. Water would be pumped from four to six wells located on land owned or leased by

¹¹ Note: 1 acre-foot equals 325,851 gallons.

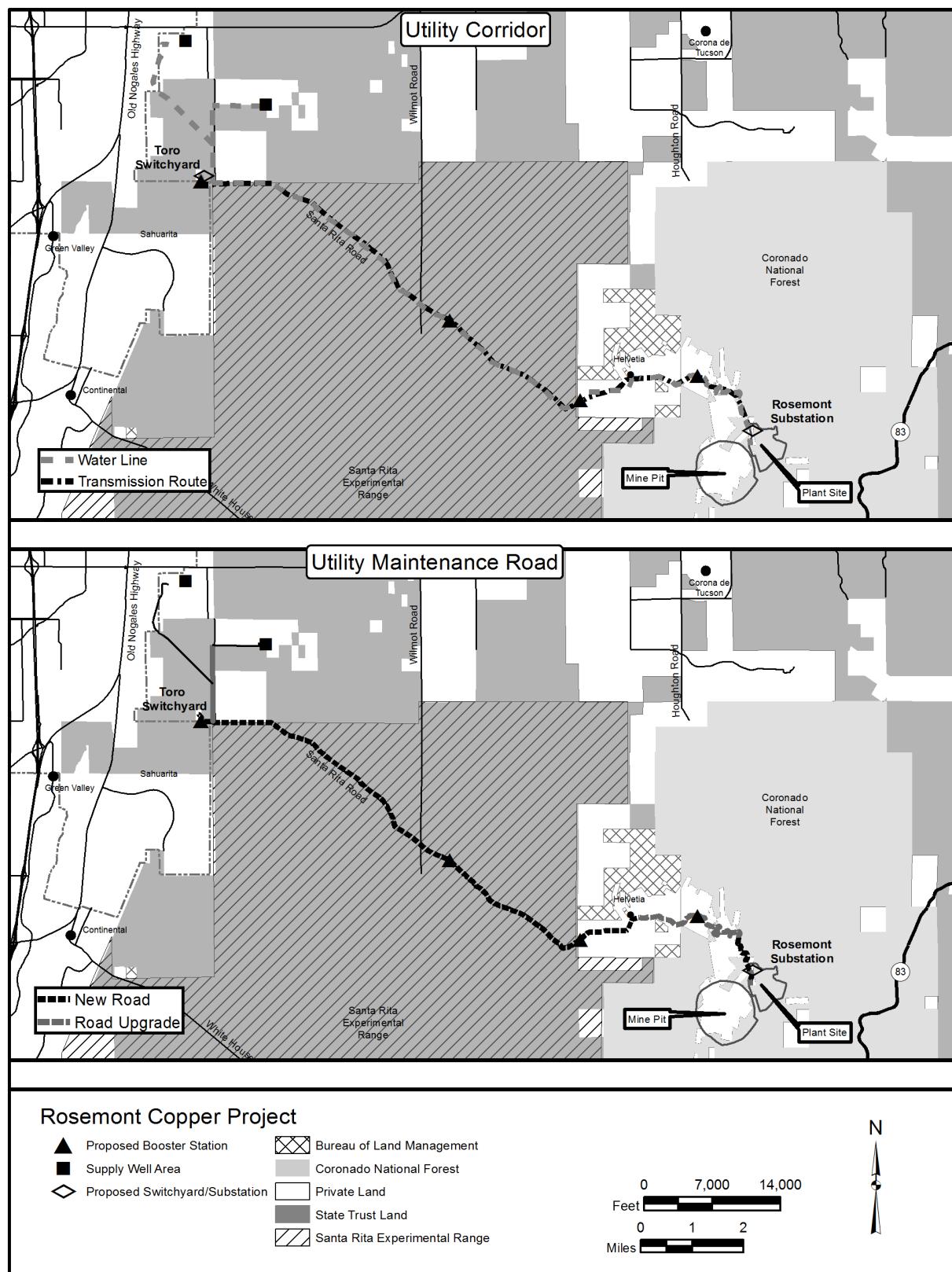


Figure 5. Approved utility alignment for the Rosemont Copper Project

Rosemont Copper near the community of Sahuarita in the Santa Cruz Valley at a maximum rate of 5,000 gallons per minute (total pumpage).

Well locations, proposed pipeline route, and pipeline route are shown in figure 5. Four booster stations would be needed to maintain water flow in the line. According to the Town of Sahuarita, these booster stations would not be consistent with aspects of their general plan (Town of Sahuarita and General Plan Advisory Committee 2002). (See the “Required Disclosures” section of chapter 3 for further information on local planning efforts.)

Total fresh water to be used during operation is estimated to be about 4.8 million gallons per day (Huss 2009:91). Most of this would be supplied by groundwater wells in the Santa Cruz Valley. It is important to note that while the well sites are depicted in figures and calculations, this disturbance has already been conducted on these private lands to create the groundwater wells. Much smaller quantities would be obtained from stormwater and pit dewatering on the mine site. Water would primarily be allocated to ore processing. Other water uses would include dust control, fire protection, drinking water, sanitary waste management, and other miscellaneous uses. It is estimated that up to 18,500 acre-feet could be obtained from pit dewatering over the life of the mine. Water acquired through pit dewatering would either be used in processing or dust control. Because the quality of the water supply is expected to approach potable standards, it would not require any additional processing to be used in various mining processes.

Where feasible, an estimated 37 million gallons of water per day would be reclaimed from a variety of uses on the mine and returned for use in processing (Huss 2009) (figure 6). Water used to process ore (referred to as process water) and other water impacted by the project would be controlled as described below.

Water Supply Pipeline

A 20-inch carbon steel water pipeline would be constructed. While it is expected that most drainage crossings would only require backfill of the previously removed material, some crossings may require nonerosive material, such as concrete, below calculated scour depth where wash composition is soil and gravel. Where rock prohibits burial, the pipeline would be placed above the rock and covered with soil, as previously specified, depending on slope, topography, and the availability of cover material.

The pipe bedding requirements would follow the manufacturer’s recommendations. Isolation valves would be installed in the pipeline at intervals of approximately 3,000 feet and at elevation changes of 250 feet. Construction of the pipeline would include up to four booster stations that would consist of a concrete sump, four vertical turbine pumps, and a pneumatic tank (M3 Engineering and Technology Corporation 2012) housed within secured buildings or structures and requiring power, as described above. The reservoirs and pump stations would be built outside jurisdictional WUS.

Water Control

The primary water control objective would be to reduce the risk of discharging potentially contaminated water into the environment. Water control would be applied to: (1) process water, (2) groundwater, and (3) stormwater that comes into contact with process facilities or tailings.

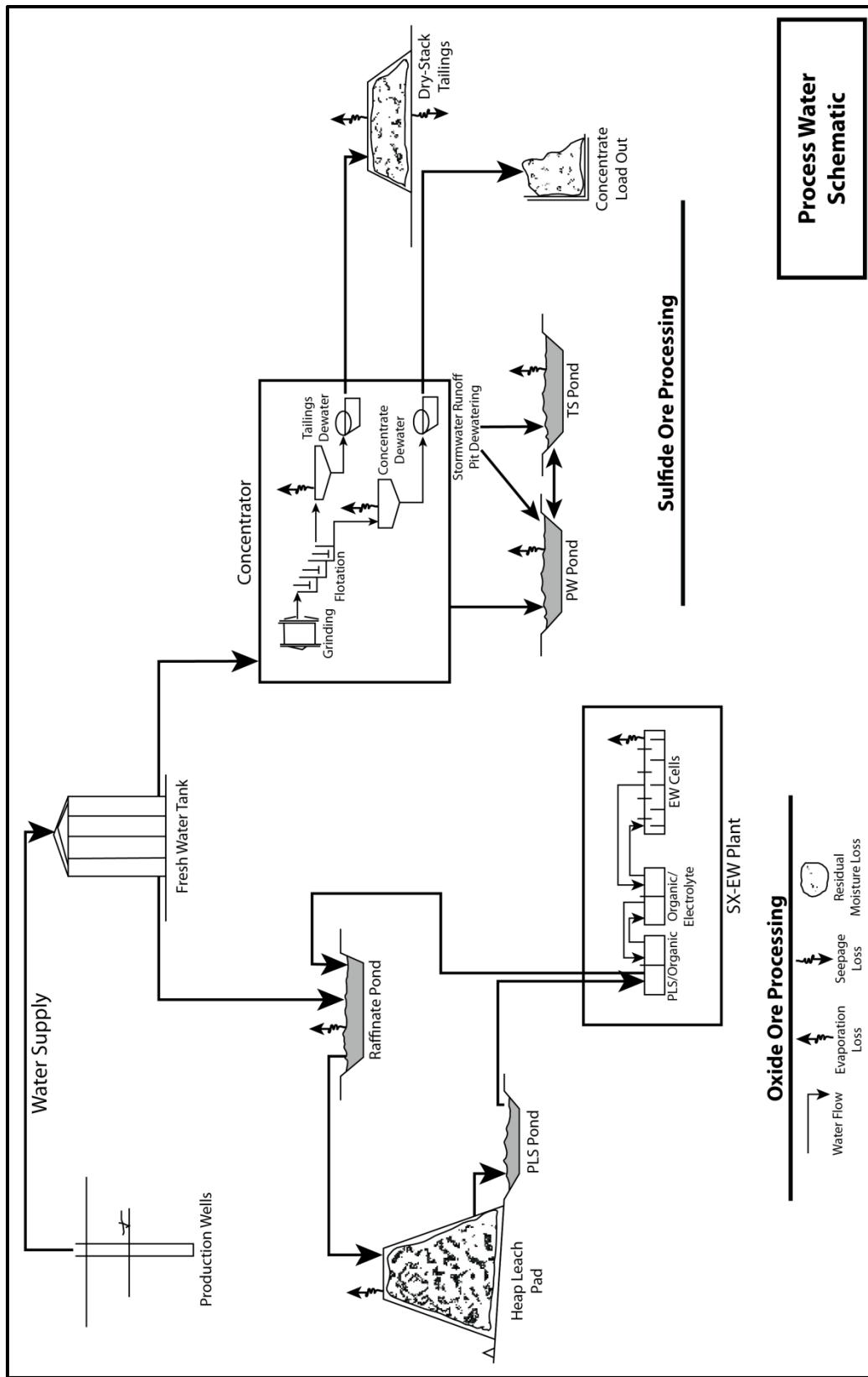


Figure 6. Process water schematic

Process Water

Figure 6 is a schematic diagram of the process water control system that shows the basic water circuits during processing of sulfide and oxide ore. Control of process water would consist of containing the process water in engineered structures, such as tanks, pipes, sumps, lined ponds, lined ditches, and a lined heap leach pad, and maintaining the water content of the dry-stack tailings at a level that minimizes seepage from the dry-stack tailings facility. The engineering design and performance of the various process water control facilities, including seepage and leakage monitoring and recovery, would meet or exceed the best available demonstrated control technology criteria used by ADEQ and would be regulated under the aquifer protection permit that was issued on April 3, 2012. Details of best available demonstrated control technologies are discussed in the “Groundwater Quality and Geochemistry” resource section in chapter 3.

Groundwater

The groundwater control system would include both activities and facilities designed to protect and monitor the quality of the groundwater in the area, as well as the investigation and modeling used to predict the response of the groundwater systems to both the withdrawal of groundwater and the influence of seepage and leakage from the project facilities. Implementation of groundwater control requirements would be monitored as part of the aquifer protection permit that has been issued by the ADEQ.

Protection of groundwater quality at the mine site during operations would primarily be achieved by using the process water controls described above. Included in these is monitoring of the seepage and leakage detection systems that are part of facility design, as required by the aquifer protection permit.

Of particular importance to long-term groundwater and surface water protection is the acid rock drainage protection and monitoring program. Monitoring to ensure that offsite groundwater quality is not impacted beyond the level allowed by the aquifer protection permit would be accomplished at specific groundwater monitoring wells as required by the aquifer protection permit and by applying best available demonstrated control technology (i.e., engineering controls and practices).

Protection of water quality following mine closure would be achieved by closure and reclamation of the process facilities, elimination of or reduction in acid rock drainage generation in the tailings and waste rock from the design and operation of the facilities, monitoring and testing required by the aquifer protection permit following mine closure, and capture of possible impacted mine site groundwater by localized groundwater flowing into the pit.

Stormwater

Stormwater would be handled differently during active mining and final reclamation and closure phases and among alternatives. However, several concepts apply to all stormwater designs. In general, stormwater (contact water) from the mine pit, ore processing facilities, and mine maintenance plant areas would be prohibited from surface discharge under the stormwater permit during operations. Stormwater allowed to be discharged, such as that from the waste rock facility and waste rock buttresses around the tailings facility, would be routed to sediment control structures, where any offsite overflow discharge point would be monitored for chemical and sediment content in accordance with an ADEQ mining stormwater general permit. Runoff from tailings is not prohibited from downstream discharge under the stormwater permit, but it would be contained onsite, along with other contact water.

The top surface of the dry-stack tailings would be exposed to precipitation only during the 20- to 25-year active mining phase. All tailings would be covered with waste rock during the final reclamation and closure phase. The general design concept for managing stormwater from the dry-stack tailings facility is to minimize infiltration of water in the tailings and prevent discharge of stormwater that comes in contact with the tailings. This would be accomplished by constructing uniform lifts of dry tailings that are buttressed by waste rock. The buttresses would be built around the tailings surface for containment and erosion control. The top of the tailings facility would be relatively impervious. That is, all precipitation would remain on top of the tailings facility to evaporate. If water ponds on top of the tailings facility, it would be pumped to the process water temporary storage pond to limit infiltration into the tailings facility. Diversion channels would be constructed during the premining phase to direct surface runoff that has not contacted tailings from the outer waste rock shell slopes into either sediment ponds or to adjacent drainages and then to a sediment control structure.

Stormwater from above the mine pit would be diverted around the pit and plant site. During the active mining phase, stormwater that falls within the mine pit and associated disturbed areas, especially stormwater that comes into contact with ore, would be contained onsite and used for mining and processing purposes. Postclosure, any stormwater that enters the pit would be retained and would contribute to the pit lake. The small ridge just east of the plant site would be eliminated postclosure in order to enable stormwater from the reclaimed plant site area to flow downstream into McCleary Canyon. Precipitation that comes into contact with waste rock does not need to be retained but can be released downstream. Regardless of this, much of the runoff from the waste rock facilities would be retained, with the exception of the perimeter waste rock buttresses. For perimeter buttresses, concurrent reclamation and appropriate best management practices would progress up the outer slopes as the buttresses are constructed. This would limit erosion potential and would allow noncontact runoff to discharge to downgradient sediment ponds and eventually to the watershed.

Active stormwater management would continue after the mine closes, as required by the mining stormwater permit and the erosion control provisions of the mine land reclamation plan, administered by the Arizona State Mine Inspector. The Arizona State Mine Inspector has jurisdiction for reclamation under Title 27 ARS Chapter 5. This is the Reclamation Act statute for reclamation of hardrock mining, which pertains to private lands with more than 5 acres of mining disturbance.

Compliance Point Dam

A compliance point dam would serve as the final onsite location where stormwater can be monitored. It is what is referred to in many technical documents as a “sediment control structure.” While this dam is common to all action alternatives, its location varies by alternative; locations are shown on the maps of each alternative later in this chapter. Note that the Barrel and Scholefield-McCleary Alternatives require more than one dam, as shown in the figures later in this chapter.

Each dam would be approximately 6 feet tall and approximately 100 to 200 feet wide and would have a storage capacity of approximately 2 acre-feet. It would be constructed during the premining phase using inert waste rock as an ADWR nonjurisdictional, unlined embankment. Normally, the area behind the embankment would be empty. During storm events, water would be temporarily impounded and slowly released through the porous rock-fill dam. Large storm events may overtop the dam and proceed downstream. If the dam is destroyed by an overtopping event, it would be rebuilt. The compliance point dam would be evaluated after the final reclamation and closure phase by ADEQ. The dam would be removed, once authorized by ADEQ, if it is determined that subsequent discharges would meet Arizona Surface Water Quality Standards.

Access to the dam would vary by alternative, but in general, Forest Service roads would be used to minimize surface disturbance to construction of the dam only. Cooperating agencies have commented on the potential for unregulated discharge of stormwater that has been in contact with ore bodies and mine processing facilities in the event that the compliance point dam is overtopped and destroyed, which could happen with some frequency. This concern is based on a misunderstanding of the purpose of the compliance point dam. The stormwater reaching the compliance point dam is not halted or retained by the dam in any way and will flow downstream in any case. The dam allows for some settling of sediment, detains stormwater temporarily, and allows for a convenient location to collect stormwater samples. The dam does not, however, prevent stormwater from flowing downstream.

In addition, the stormwater reaching the dam would not at any time have contacted tailings, ore stockpiles, or processing facilities. Stormwater from those areas would be completely retained onsite in various stormwater ponds and would not be allowed to discharge downstream under any scenario. Stormwater reaching the compliance point dam would have only been in contact with waste rock, either flowing off of the perimeter buttress or the waste rock facility, or, once closed, the waste rock cap over the tailings facility.

Primary Access Road

A new two-lane paved road, referred to as the “primary access road,” would be constructed to provide primary access between SR 83 and the mine. The primary access road would leave SR 83 along a straight section of the State highway. At the intersection, SR 83 would be widened, and new lanes would be added. Their locations and length would vary by alternative; they are shown on footprint maps for each alternative later in this chapter.

Public use would be restricted on portions of the primary access road at the perimeter fenceline during the premining, active mining, and final reclamation and closure phases of the mine because of safety considerations but would be reopened to the public after closure. Although the location of the primary access road and the segments where public use would be allowed varies by alternative, all action alternatives would allow some public use of segments of the primary access road outside the perimeter fence to allow access to adjacent public lands. The primary access road would be subject to periodic short-term restriction of public use for maintenance and to protect public safety. Restricted areas would be indicated by signage, gates, and/or a security guard shack located near the plant site. Segments of the primary access road would be added to the Coronado’s National Forest System road (NFSR) inventory.

Utility Maintenance Road

Referred to as the “secondary access road” in the DEIS, a better understanding of this road and its function resulted in its being renamed the “utility maintenance road.” This road would be located within the utility corridor to serve as access to the power supply line, water supply line, and water booster pump stations (see figure 5 in this chapter). The road would consist of two discrete segments: one from the plant site, over Lopez Pass, to a major wash on private land; and another from the supply well area near Sahuarita to the other side of the major wash, generally following the electrical transmission and water line location. Overall, this road would require more than 11.5 miles of new construction and 4.5 miles of reconstruction or upgrade to an existing road. Refer to figure 5 for a map of the utility maintenance road.

A gravel road would be constructed from the plant site to Lopez Pass to serve as a maintenance road for the utility supply lines. The existing road over Lopez Pass (NFSR 505) is on NFS land and private land. While NFSR 505 is considered a Forest Service system road, the Forest Service does not have legal access across private land. There are small portions of the new road construction that overlap existing NFSR 505, and those would be reconstructed as part of the utility maintenance road. However, most of the alignment would require new construction from the plant site to its western terminus. The rocky, hilly portion of the road would be reconstructed, and a new road would be created that would run west across private land. The road would intercept a major wash at its western terminus. There are no plans to construct a crossing of this wash, which would require an engineered structure. The second segment of the utility maintenance road would begin at the area of mine water supply wells near Sahuarita and follow the location of the electrical transmission and water lines. This road segment would cross land administered by the ASLD and private lands and would generally parallel Country Club and Santa Rita Roads.

Where the water pipeline to the mine travels under Santa Rita Road, the utility maintenance road intersects the public roadway. It would be gated here to prevent unauthorized access. Because there are different mine water supply well locations, the utility maintenance road would include spurs that extend to these locations as required. See figure 5 in this chapter. The waterline segment to the northernmost well would not require a new road and would use the existing adjacent Santa Rita Road for construction and maintenance until it intersects with Country Club Road.

A right-of-way (ROW) permit from ASLD is required for the sections of the utility maintenance road and utility corridor on State land. A ROW application has been filed; the ROW permit itself will not be issued until approval of the project by the Forest Service. The sections of the road within the ASLD ROW would be new construction. ASLD will also decide at a later date whether they intend to require an additional fence between the utility maintenance road and the rest of the Santa Rita Experimental Range. The Town of Sahuarita also signed an agreement with Rosemont Copper allowing use of a portion of its current ROW alongside Santa Rita Road (Town of Sahuarita and Rosemont Copper Company 2013). This license agreement provides access to the northernmost well via Santa Rita Road. Use of Santa Rita Road for construction, maintenance, or crossing of the waterline may require additional permitting by Pima County.

The utility maintenance road would be required to meet MSHA standards by including truck axle-high berms (anticipated to be about 3 feet high) on the sides of the section of roadway located on Rosemont Copper private lands. Some road reconstruction would be on NFS lands before the road intersects private lands, and the Coronado would negotiate with MSHA to accommodate safety while minimizing impacts to NFS surface resources. Otherwise, the segments on ASLD would be a standard 14-foot-wide native surface road without any additional MSHA requirements.

The utility maintenance road would be closed to the public during construction and operation of the mine, and portions may be reopened to the public after closure, depending on safety concerns. It is the intent of the Coronado to restore public access over Lopez Pass. However, a section of this road crosses private land, and there is currently no legal right of public access. While the Coronado would work with the landowner to secure a permanent public easement for this segment of road, it is unknown at this time whether legal public access would be available postclosure. The portions of this road on private lands would remain after the pipeline and booster stations are removed. For sections on State land, ASLD would ultimately decide which portions would be retained, removed, or revegetated through their ROW permitting process.

Other Area Roads

If the mine project is approved, all NFSRs within the perimeter fence not used for mining activities would be decommissioned. A short section of new temporary road (disturbing an estimated 0.2 acre) and use of a segment of NFSR 4064 would be necessary for installing and accessing air quality monitoring equipment to be located at the perimeter fence. Actual decommissioning activities could range from closing and abandoning the road, to activities such as scarifying the road surface to discourage motorized use and promote vegetative recover, to full topographic recontouring. For the sake of analyzing impacts, it is assumed that all miles of NFSRs within the perimeter fence would be actively decommissioned, and the acreage of these roads is contained in disturbance calculations used for various impact analyses (see table 11 in this chapter). NFSRs that are cut off by the perimeter fence would either be decommissioned, rerouted to connect to another area road, or have a turnaround area constructed exterior to the fenceline. New roads would be added as NFSRs, while decommissioned roads would be removed as NFSRs. Within the project area, the Forest Service was granted a ROW from ASARCO Corporation in 1993 for NFSRs 231, 4051, and 4064, for the portions that cross private land. These ROWs remain valid, although title of the underlying land is now held by Rosemont Copper. These roads would be decommissioned with all action alternatives. In addition, a short segment of existing road on Rosemont Copper private property that accesses the R2 Adit would have a physical barrier installed to eliminate motorized access to this lesser long-nosed bat roost site.

With the exception of the Scholefield-McCleary Alternative, new road segments designed to connect remnant NFSRs are described for the action alternatives. For all alternatives except the Scholefield-McCleary Alternative, this would include the construction of a new road from the primary access road to unauthorized road 4050-0.36R-1 (which intersects NFSR 4050 about 0.3 mile farther west), in order to continue to provide legal public access to the Sycamore Canyon area once the unauthorized road is adopted as an NFSR. The completed pair of road segments is referred to as the “Sycamore Connector Road.” Because some Open-Authorized-Restricted roads, which are only open to motorized use by permittees and administrative use, are typically used in the project area for access to grazing allotments, these would mostly remain intact to allow administrative and permitted use postclosure. Construction of the Sycamore Connector Road would be required to be completed within 1 year of the date on which public access to NFSR 4050 is cut off due to mine related activities. During operations, Rosemont Copper would be responsible for providing access, in some form, to the grazing lease holders for management of their allotments and to the Forest Service for permit administration. Access in the project area and roads to be constructed and decommissioned would vary by alternative and are described as part of the alternative descriptions that follow.

Transportation on State Route 83

The primary mine access road would require a new intersection with SR 83. The current Arizona Department of Transportation (ADOT) encroachment permit process includes the intersection location that applies to all alternatives except Scholefield-McCleary. The existing two-lane roadway would be reconstructed to include a northbound left-turn lane, a southbound right-turn lane, and a merging northbound acceleration lane. All intersection improvements would occur between mileposts 46.63 and 47.14 (Ninjo and Moore 2012). Portland cement concrete would form the surface approximately 100 to 200 feet north and south of the intersection and the access road turnout. Asphaltic concrete would be used for the remainder of the project alignment. To improve drainage from the intersection, Rosemont Copper would upgrade current drainage structures in the area in accordance with ADOT requirements (Bartz 2012). The project would also include a turnout

connecting to an NFS unpaved roadway and temporary pavement during construction (Ninyo and Moore 2012).

As part of the intersection encroachment permit, Rosemont Copper has agreed to fund a lump sum amount to perform or implement the design, construction, and maintenance of road improvements to SR 83 elsewhere. These improvements are considered in this EIS as a connected action (see chapter 1), and ADOT has indicated that these improvements would consist of a 3-inch asphalt-concrete overlay, guardrail reconstruction, pavement markings, and shoulder buildup from the primary access road intersection north to milepost 58.5. In addition, three existing bus pullouts on SR 83 at mileposts 47.9, 49.2, and 52 would be paved. All of these would be within the ADOT ROW and would not require additional ground disturbance (Arizona Department of Transportation 2012a).

After the ROD is issued, it is expected that ADOT would issue an encroachment permit for improvements to the Rosemont Junction intersection serving NFSR 231. Rosemont Junction would provide temporary site access during the premining period to the project site while the intersection for the primary access road is being constructed. The intersection upgrades for this temporary construction route consist of improvements to the turnout for Rosemont Junction (South Helvetia Road) at milepost 46.63 on SR 83. The improvements include raising Rosemont Junction to match existing pavement. It also includes the installation of new cattle guards and fencing to guide traffic to the newly widened, gravel-padded Rosemont Junction. Stormwater and sediment controls are also designed as part of the overall improvement plans. An estimated 200 feet of NFSR 231 on NFS land beyond the ADOT easement will be reconstructed to match the intersection and grade to the existing road. This reconstruction will result in an estimated 0.37 acre of disturbance.

Mine related traffic on SR 83 during operation would consist of trucks carrying supplies to the project, trucks carrying concentrate and copper cathodes from the project, and employee traffic. Equipment and construction material deliveries to the site would be in addition to large-truck trips. Major equipment arriving by rail may be received at the Port of Tucson, which is located near Vail, Arizona, to the west of the project area. Table 2 shows Rosemont Copper's estimate of the large-truck shipments for the MPO and the Barrel Alternative on a weekday during year 1 and year 20 of the operations phase.

As table 2 shows, the Barrel Alternative would have the smallest number of large-truck trips for both operation years 1 and 20 because the heap leach pad is not included in this alternative and there would be no truck trips for delivering sulfuric acid to a heap leach pad, nor would there be transport of copper cathodes, which would not be produced.

Table 2. Large-truck trip per weekday data (years 1 and 20 of operations phase)

Materials	MPO		Barrel Alternative	
	Round Trips per Week Year 1	Round Trips per Week Year 20	Round Trips per Week Year 1	Round Trips per Week Year 20
Copper concentrate	56	56	50	50
Copper cathode	4	0	0	0
Sulfuric acid	9	9	0	0
Materials (e.g., lime, fuels, etc.)	19	19	19	19
Total	88	84	69	69

Source: Psomas (2012b).

Copper concentrate shipments would form the largest number of routine truck shipments for both the Barrel Alternative and MPO, with approximately 50 to 56 round trips per day 7 days per week, respectively. Because the project area would have limited onsite parking during the premining phase, all anticipated daily worker commuter trips would be by bus. More specifically, the estimated 1,250 workers needed during construction would require 37 daily round trips by bus. During operation, worker commuter trips would vary from approximately 266 to 311 round trips per day, depending on the year and the alternative. Worker commutes for the operations phase are assumed to be one trip per worker (no carpooling or busing). The largest concentrated volume of mine traffic during a 24-hour period would occur during workforce shift change during the operations phase. Shift changes would vary between 6 a.m. to 8 a.m. and 4 p.m. to 6 p.m.

Arizona National Scenic Trail

The Arizona National Scenic Trail is a nationally designated scenic trail that extends more than 800 miles from Mexico through Arizona to Utah. This trail is part of a national network of trails that was originally established by Congress in the National Trails System Act, which states,

National scenic trails, established as provided in section 5 of this Act, which will be extended trails 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. National scenic trails may be located so as to represent desert, marsh, grassland, mountain, canyon, river, forest, and other areas, as well as landforms which exhibit significant characteristics of the physiographic regions of the Nation. (16 United States Code (U.S.C.) 1242)

The Las Colinas portion of the Arizona National Scenic Trail runs through the project area. Approximately 10 miles of trail would have to be relocated to accommodate the project and the demand for use of the trail (figure 7). Both potential trail alignments were designed to avoid archaeological sites and important biological plant communities; see the “Biological Resources” and “Cultural Resources” resource sections of chapter 3. It would have a 24-inch tread and would be cleared from 6 to 8 feet wide and 10 to 12 feet high to accommodate multiple uses, such as hiking, biking and horseback riding. Although different alignments are proposed for the action alternatives (see maps of alternatives in this section), the trail would be constructed to the same standards, regardless of location. Construction of new trail segments would be completed within 1 year of approval of the ROD. The trail would be pioneered and available to public use prior to closing the existing trail (refer to “Mitigation Effectiveness” in the “Recreation and Wilderness” section and to appendix B for further information).

Actions to construct alternate locations of the Arizona National Scenic Trail and associated facilities would include periodic maintenance of the trail and facilities. If the trail is realigned on the west side of SR 83 by the proposed action or Phased Tailings Alternative, it would require and would involve construction of about 7 miles of new trail and the installation of a trailhead located off the primary mine access road, close to the perimeter fence (see maps of alternatives later in this chapter). The trailhead, estimated to be up to 3.7 acres, would be designed to accommodate 18 passenger vehicles and 12 horse trailers and would include a bathroom and water source. It would also include a gravel parking surface, perimeter fence, and gates and signs to deter off-highway-vehicle use.

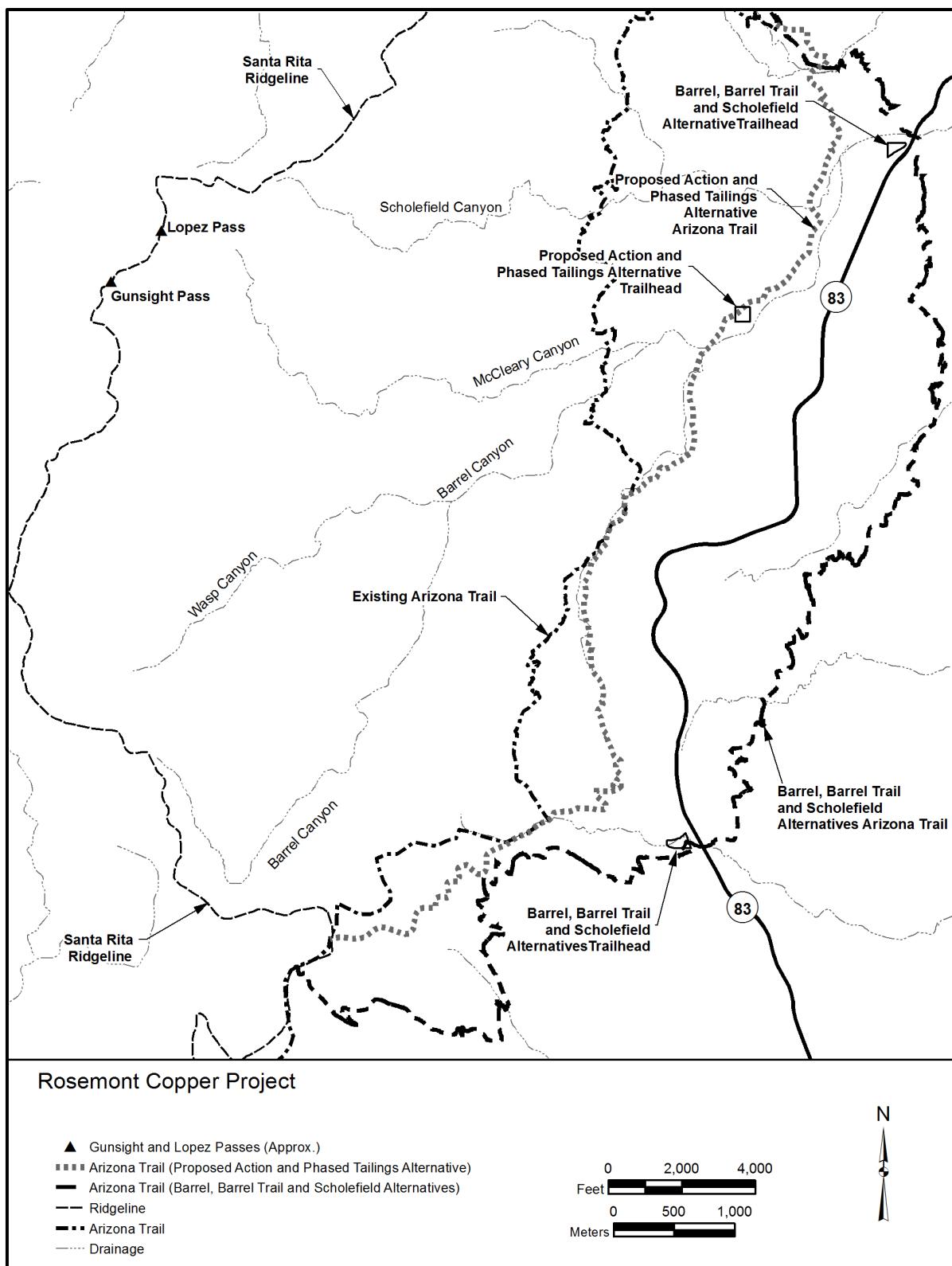


Figure 7. Arizona National Scenic Trail relocations

Currently, the realigned trail location on the east side of SR 83, which applies to the Barrel, Barrel Trail, and Scholefield-McCleary Alternatives, would require construction of about 13 miles of new trail and the installation of trailheads at Oak Tree Canyon and at the intersection of SR 83 and Hidden Valley Ranch Road. The trailhead at Oak Tree Canyon, estimated to be up to 3.7 acres, would be designed to accommodate 18 passenger vehicles and 12 horse trailers and would include a bathroom and water source for pack stock and wildlife. It would also include a gravel parking surface, perimeter fence, and gates and signs to deter off-highway-vehicle use. The Hidden Valley Ranch Road trailhead, estimated to be up to 2.5 acres, would accommodate eight passenger vehicles and four horse trailers on a gravel parking surface, a post and rail fence, and gates and signage to deter off-highway-vehicle use. Metal gates, signs, and fencing would be used to deter off-highway-vehicle use on the trail, and gates would be used to accommodate equestrian and mountain bike crossing in areas where there are existing fence lines. Fencing would be extended from the trail gate near Oak Tree/Davidson Canyons in order to properly protect the corridor. Signage consistent with the Arizona National Scenic Trail would be installed, as well as detour and construction signage once construction takes place.

Interim Management

All approved MPOs on Forest Service administered lands contain an interim management plan that specifies the measures to be taken in the event of an extended period of nonoperation before mining is completed. The actions to be taken under the interim management plan usually depend on the length of nonoperation, which is typically categorized as short term (a few months to 1 year) or long term (more than 1 year). Actions to be taken are meant to stabilize the excavation and tailings/waste rock facilities, isolate and control any toxic or deleterious materials, store or remove equipment, supplies, or structures, maintain the project area in a safe and clean condition, and monitor site conditions. Typical short-term and long-term interim management actions are described below.

Typical Short-Term Interim Management

A short shutdown of a few months to 1 year would require minimal action, depending on the stage of operations. In this case, a few employees may be kept at the mine site for repair and maintenance work, and a watchman may reside at the mine site. All inventory items that may deteriorate in a year's time, such as explosives, oil, gas, and first-aid supplies, would be used or removed from the mine site. Hazardous materials at the mine site would be secured with locks in the shop building or warehouse. All equipment would be checked, and most of it would be stored in the shop building or in the mine working. Ventilation fans, electric lines, and transformers would be left in place.

All stockpiles above economic grade would be processed or maintained at the site. Measures would be taken to ensure that tailings and waste rock facilities would be stabilized if necessary.

Monitoring would occur during the period of short-term interim management. The mine facilities area, buildings, mine pit, roads, ponds, and surrounding fencing would be inspected on a regular basis that would be determined by the Forest Service. Maintenance of facilities and stabilization structures and controls would occur at the mine site following inspection activities and would be reported in quarterly and annual reports. In addition, all permits would be maintained during closure, and permit conditions would be adhered to.

Typical Long-Term Interim Management

In the event of nonoperation for more than 1 year, typically, a different procedure would be followed. Nearly all mobile equipment and a portion of the fixed equipment would be removed from the mine site. The buildings would be left in place but secured and maintained in the same manner as for short-term interim management. All hazardous materials would be removed from the site and disposed of in accordance with State and Federal regulations.

Like with short-term interim management, all stockpiles above economic grade would be processed or maintained at the site. Measures would be taken to ensure that the development rock pile is stabilized if necessary.

Similar monitoring would occur during the period of long-term interim management. The mine facilities area, buildings, mine pit, roads, ponds, and surrounding fencing would be inspected on a regular basis. Maintenance of facilities and stabilization structures and controls would occur at the mine site following inspection activities and would be reported in quarterly and annual reports. In addition, all permits would be maintained during closure, and permit conditions would be adhered to.

If operations are inactive for a longer period of time (i.e., 5 consecutive years), the Forest Service would review the operations and determine whether the Forest Service should terminate the existing MPO and direct final reclamation and closure. If the Forest Service determines that operations have been abandoned, they may initiate forfeiture. If the amount of the financial guarantee is inadequate to cover the costs of reclamation, the Forest Service may complete the reclamation, and the operator and all other responsible persons are liable for the costs of such reclamation.

Reclamation and Closure

Reclamation of the project would be administered and regulated by the Coronado (36 CFR 228) on NFS lands; administered and regulated on private land by the Arizona State Mine Inspector (ARS 27-901 et seq., as amended); and regulated by the ADEQ (ARS 49-241 through 49-252; and AAC 18-9-101 through 403).

Reclamation and closure plans have developed as the NEPA process has progressed. The 2007 preliminary MPO included a conceptual reclamation and closure plan (Tetra Tech 2007d), which was updated in 2010 for the other action alternatives (Tetra Tech 2010f). Following publication of the DEIS and in part in response to public comments received, the reclamation and closure plan was updated to focus solely on the preferred alternative (CDM Smith 2012a). This latest reclamation and closure plan provides details for the phasing and locations for reclamation activities, details of postclosure site water management, and preliminary calculations of reclamation and closure costs.

In concept, reclamation and closure consists of several components common to all action alternatives:

- Removal of all equipment and buildings; building foundations may be broken up and buried, or removed;
- Capping of the top of the tailings facility with waste rock upon closure;
- Removal of pond liners as deemed appropriate under the aquifer protection permit;
- Regrading and revegetation of the plant and mill site areas upon closure;
- Regrading and revegetation of any access roads requiring closure;

- Removal of electric supply line, water supply line, and related facilities from NFS lands;
- Revegetation of utility corridors where removal causes soil disturbance;
- Concurrent reclamation¹² and revegetation of the landform that encompasses the waste rock and tailings facilities, beginning as early as year 1, as portions of the waste rock buttress are completed;
- Salvage of soil resources and selected vegetation for reuse in revegetation activities;
- Removal of perimeter and security fencing;
- Construction of fencing and/or berms for safety considerations;
- Establishment of postclosure access roads; and
- Reestablishment of downstream drainage and surface water flow.

Several considerations were incorporated into mine design to facilitate later reclamation and closure. These include managing operations to minimize environmental impacts, constraining disturbances to a minimum number of drainages to minimize downstream hydrologic disturbance, constructing waste rock buttresses to allow for concurrent reclamation of outer slopes, and using appropriate technology to minimize the generation of impacted water.

With the exception of most roads within the plant site, access roads into the project area would remain after closure. Specifically, the primary access road and portions of the utility maintenance road would remain, and a road would be maintained through the plant site to access the waste rock/tailings landform for monitoring and maintenance. Roads may also remain on top of and around the toe of the waste rock/tailings landform to allow for postclosure monitoring activities and use of the land for grazing.

Postmine land use of NFS lands would be the same for all action alternatives and would follow the direction in the forest plan that is in place at that time. Postmining/closure reclamation objectives for Rosemont Copper's private land could include dispersed recreation, wildlife habitat, and ranching.

At closure, fence construction for the mine pit under all action alternatives would be a minimum of three-stranded barbed wire with warning signs. AAC R11-2-401 specifies measures that include fencing and signage. Additionally, Rosemont Copper would construct structures to provide additional safety protections if needed, such as berms around the pit, possible "tank traps" as necessary to restrict road access, and upgraded fencing (i.e., chain link) if necessary on steeper slope areas above the pit or other areas.

Operating facilities would be demolished and removed, and building foundations would be demolished, covered with soil, and graded or removed. All areas would be surveyed for the presence of contaminants, and any contaminated soils, reagents, or fuels would be disposed of offsite at licensed facilities.

For all alternatives but the Barrel Alternative, it is anticipated that by year 10, leaching of the heap leach facility would be completed. At that time, the ponds would be decommissioned, and residual

¹² Concurrent reclamation is a term that describes the concept of reclaiming and revegetating the outer surface of a slope while other operations continue to take place. The phasing and timing of concurrent reclamation differs for each alternative, depending on the ability to safely begin reclaiming the outer surface of tailings and waste rock facilities between tiers of construction. For a better understanding of how this would be integrated into each alternative, see the alternative descriptions that follow.

leach solutions would have evaporated or been processed. Once the ponds are decommissioned and have been deemed closed or are under active management and in compliance with the aquifer protection permit issued by the ADEQ, the facility would be completely covered by waste rock.

With respect to revegetation of the waste rock and tailings landforms, Rosemont Copper would be responsible for designing and implementing revegetation procedures. The Coronado, however, would define the criteria that must be met for revegetation to be considered a success, and all designs and techniques must be approved by the Coronado. Planned revegetation techniques, expected success criteria, and details of how concurrent revegetation of these areas would be phased are described in the “Soils and Revegetation” resource section of chapter 3. In order to assess the potential success of the revegetation plans, the Coronado has considered the results of greenhouse studies and onsite reclamation plots conducted by Rosemont Copper. These results are also summarized in chapter 3.

Permits and Authorizations

Permitting and authorization requirements discussed in this section apply to all action alternatives, including the proposed action. Federal mining laws provide for mineral exploration and development on Federal lands, and State and Federal environmental laws are intended to ensure that adverse impacts are minimized and that long-term productivity of the surface resources is preserved to the extent practicable.

The Coronado, as the lead Federal agency for the Rosemont Copper Project EIS, has a primary role in approving and administering the project. The USACE is a Federal cooperating agency that has a role in approving the project and administering aspects of the project. The Coronado coordinates with jurisdictional permitting agencies in the determination of compliance with applicable laws and regulations. Besides the Coronado and the USACE, other agencies that may require or have a role in issuance of permits or authorizations for the project are the U.S. Department of Transportation, EPA, U.S. Fish and Wildlife Service (USFWS), ACC, Arizona Department of Agriculture, ADEQ, ADWR, Arizona State Mine Inspector, State Historic Preservation Office, and Pima County Departments of Environmental Quality and Transportation. Those Federal and non-Federal agencies with authorization or permitting authority may also have continuing responsibility for administering their respective responsibilities.

Permits and authorizations that have been obtained or may need to be are summarized in table 3. This list is not intended to be exhaustive but rather to highlight the major permits and authorizations that may apply.

Table 3. Permits and authorizations that may be applicable to the proposed Rosemont Copper Mine

Agency	Permit or Authorization	Purpose
Federal		
Forest Service	Revised MPO (after publication of the FEIS and approval of the ROD)	A revised MPO would be required to reflect requirements specified in the ROD, including requirements of all applicable permits and authorizations.
USACE	Project-specific (Individual) Section 404 Permit (CWA)	Required for the discharge of dredged or fill material into WUS.
U.S. Department of Transportation	Hazardous Materials Transportation Permit	Governs the transport of hazardous materials as defined by the U.S. Department of Transportation. Requires specific employee training and security and contingency planning.

Agency	Permit or Authorization	Purpose
EPA	Hazardous Waste Identification Number	Authorizes facilities to generate and transport offsite hazardous waste in quantities in excess of 100 kilograms per month (or those that generate acute hazardous waste in quantities exceeding 1 kilogram per month). Requires specific employee training, inspections, and contingency planning.
USFWS	Biological Opinion	Ensures that the Coronado's approval of the revised MPO would not jeopardize the continued existence of a threatened or endangered species or adversely modify designated critical habitat. Necessary for compliance with Section 7 of the Endangered Species Act.
State of Arizona		
ACC	CEC	Ensures compliance with ARS 40-360 and regulates the placement of electrical transmission lines.
Arizona Department of Agriculture	Agriculture Land Clearing Permit	Authorizes disturbance and clearing of State protected native plants, as required under the Arizona Native Plant Law.
ADEQ	Aquifer Protection Permit	Regulates the direct or indirect addition of pollutants to groundwater. Specifies best available demonstrated control technology (design criteria and/or operation practices) to control discharge of pollutants to groundwater and establishes aquifer water quality limits enforced at points of compliance specified for the facility. Requires monitoring, reporting, contingency planning, and financial assurance.
ADEQ	Air Activity Permit	Applies to activities (such as earth moving, trenching, road building, blasting, etc.) leading up to mining and well development.
ADEQ	Air Operating Permit	Applies to emissions from activities during operations. Requires inspection, sampling, monitoring, contingency/emergency planning, notification, reporting, and compliance certification.
ADEQ	Section 401 Certification	State must certify, waive, or deny an application for a USACE permit for discharge of dredged or fill material to WUS. To certify, the State must find that the activities proposed under the 404 permit would not result in a violation of State surface water quality standards. The 401 certification may specify conditions, including reporting requirements.
ADEQ	Arizona Pollutant Discharge Elimination System General Permit for Discharges from Construction Activities (State primacy over Section 402 of the CWA)	Authorization under this permit is required for discharges of stormwater to WUS resulting from construction activities disturbing 1 acre or more. Requires implementation of site-specific best management practices to control pollutants in stormwater runoff from construction activities. Regular inspections required. Construction activities on the mine site are likely covered under the industrial permit as described below; a separate construction general permit may be needed for the power line, pipeline, and utility maintenance road.

Agency	Permit or Authorization	Purpose
ADEQ	Arizona Pollutant Discharge Elimination System Permit for Stormwater Discharges from Industrial Activities (State primacy over Section 402 of the CWA)	Required for discharges of stormwater to WUS resulting from industrial activities. Two general permits that together authorize stormwater discharges associated with industrial activity from 29 industrial sectors (25 nonmining and four mining) for industrial stormwater discharges are available for coverage from ADEQ. The mining general permit includes applicable construction stormwater general permit language to accommodate a mine's nearly continual phase of construction throughout the life of its operations. Requires inspection, sampling/analysis, planning, reporting, and compliance evaluations, with permit renewals every 5 years.
ADEQ	Arizona Pollutant Discharge Elimination System (de minimis)	Allows discharges from well development activities into drainages. Requires inspection, sampling/analysis, reporting, and planning with permit renewals every 5 years.
ADEQ	Solid Waste Plan Approval	Is required to meet the requirements of 40 CFR 257, along with other requirements set forth in State statutes (e.g., compliance with location restrictions, recording of a restrictive covenant).
ADEQ	Hazardous Waste Management Program	Governs the management of hazardous waste (including transport and disposal). Requirements differ somewhat, depending on the volume and nature of hazardous waste generated; however, in general, it requires inspection, training, and contingency/emergency planning.
ADEQ	Drinking Water Registration and Regulations	Systems (including nontransient, noncommunity systems) must register with ADEQ and meet substantive requirements. Requires inspection, sampling/analysis, contingency/emergency planning, reporting, and notification.
ADOT	ROW Encroachment Permit	Authorizes the construction of the intersection of the primary access road in the ROW for SR 83 and the intersection with NFSR 231 that would provide temporary access while the primary access road is being constructed.
ADWR	Groundwater Withdrawal Permits	Permits withdrawal of groundwater
ADWR	Recovery Well Permit	Allows recharged water to be recovered through groundwater pumping
ADWR	Well Drilling Permit	Issued any time drilling may intercept the water table. Requires paperwork to be filed by a licensed well driller.
ASLD	ROW Permit	Allows water and electrical supply lines to be placed within a ROW. Permit would be issued after the ACC approves the electrical supply alignment.
Arizona State Mine Inspector	Arizona Mined Land Reclamation Plan Approval	Applies to reclamation activities at the site. Requires certification, plan updates, annual reporting, and financial assurance.
State Historic Preservation Office	Section 106 of the National Historic Preservation Act	The State Historic Preservation Office consults on proposed Federal actions to ensure that formal mitigation procedures are followed regarding adverse effects on historic resources protected under the act.

Agency	Permit or Authorization	Purpose
ADWR	Water Storage Permits	Augusta Resource Corporation currently has three water storage permits with ADWR. Note that Rosemont Copper/Augusta Resource Corporation is <u>not</u> required by ADWR to store water, but they have elected to store water in the Tucson Active Management Area. As of December 31, 2010, their long-term storage balance was 42,593.02 acre-feet of Central Arizona Project credits (Arizona Department of Water Resources 2013).
Pima County		
Pima County Department of Environmental Quality	Fugitive Dust Activity or other Air Permits	Pima County states that this permit is required for ground-disturbing activities not within the perimeter area of the ADEQ Class II Air Quality Permit, such as the new roads and utility supply construction.
Pima County Department of Environmental Quality	Hazardous Waste Management	Registers all EPA ID numbers.
Pima County Department of Environmental Quality	Drinking Water System Registration	Registers all noncommunity, nontransient drinking water systems. Requires sampling and emergency planning.
Pima County Department of Transportation	ROW Use Permit	Pima County states that this permit is required for use of Santa Rita Road for the utility supply lines' construction, maintenance, or crossing. Pima County also states that this permit is required for use of Kolb and Valencia Roads for use by oversize or overweight vehicles like those that could be used for transporting shipments to the Port of Tucson.
Pima County Development Services	Outdoor Lighting Permit	Pima County states that this permit is required for construction and installation of outdoor lighting. State law exempts mining facilities from these local requirements.
Pima County Development Services	Grading Permit	Authorizes lot development for well sites, grading, and fencing on county and private lands.
Pima County Regional Flood Control District	Floodplain Use Permit	Required for activities that might obstruct, retard, or divert the flow of water in a watercourse. Required for private lands in unincorporated areas of Pima County.
Pima County Cultural Resources and Historic Preservation Office	Various Ground-Disturbing Permits; May Include Cultural Resources Process	To ensure that all projects on County land or ROWs with the potential to impact cultural resources comply with applicable laws or regulations.

The Forest Service and the USACE will each sign a ROD that identifies that agency's selected alternative and specifies activities that will be authorized on lands or resources administered by each agency. The MPO would be revised as needed to reflect the requirements contained in the permits and the ROD and would be submitted to the Forest Service for review and approval. After the final MPO is approved by the Forest Service and all permits and approvals are granted, Rosemont Copper Project activities on federally administered lands may commence. It should be noted that some activities on private lands may commence without Forest Service or USACE approval.

The following sequence of events is provided to illustrate the Rosemont Copper Project approval and implementation process:

- Following issuance of the RODs, Rosemont Copper would submit a revised MPO and provide the necessary reclamation bond, which complies with the selected alternative described in the ROD and other local, State, and Federal permits in effect at that time. If the revised MPO proves acceptable, the Coronado will approve the MPO, contingent upon Rosemont Copper's receiving the all local, State, and Federal permits. At this point, activities that do not require approval or permit by other local, State, and Federal agencies may proceed. If required permits are not received, actions cannot commence on NFS lands.
- A construction schedule would be submitted to the Coronado that indicates the order of activities and which activities and mitigation measures are required prior to initiation of construction. The Coronado would review these supplements to ensure that they are within the scope of the Rosemont Copper Project EIS and approve any changes needed in the approved MPO. If the effects of the proposal are within the scope of the EIS, approval to proceed would be granted following submittal of a bond to reclaim the surface resources affected.
- The USACE would determine whether to issue or deny an individual permit for the discharge of dredged or fill material into WUS.
- The ADEQ would determine whether to issue the 401 Certification and the Arizona Pollutant Discharge Elimination System permit or authorization prior to discharge of any pollutants to WUS. Any stipulations, conditions, and monitoring required by the Arizona Pollutant Discharge Elimination System permit would be in place as required by the permit. Rosemont Copper would obtain the necessary stormwater permits prior to initiation of any activity that would result in a discharge of pollutants to WUS.
- After the first year of operation, additional details about the following year's proposed operation would be submitted to the Coronado in an annual work plan, which would include a summary of the previous year's activities, would describe the schedule of operations for the following year, and would include a statement verifying that all the operations are being carried out as described in the approved MPO. The Coronado would periodically review project status and activities to ensure that the project is covered by a sufficient reclamation bond. A multiagency group convened by the Forest Service would evaluate monitoring results at least annually and make recommendations to the Coronado Forest Supervisor. If, after review of these annual supplements, the Coronado determines that activities are exceeding the scope of the selected alternative and approved MPO, a modified MPO would be required. This could result in temporary suspension of operations, and additional analysis would be conducted as required under NEPA and Forest Service regulations.
- As required permits are approved, Rosemont Copper would submit them to the Forest Service as supplements to their approved MPO. The Coronado would review the conditions of the approved permit(s) to ensure that they are consistent with the terms of the ROD and approved MPO and that they would not result in any adverse environmental effects that have not been considered in the NEPA analysis and documented in the FEIS, ROD, and project record. After this review, the Coronado would either accept the permit as a supplement to the approved MPO or notify Rosemont Copper that the permits constitute a modification of its approved MPO and that additional NEPA analysis and documentation are required. These procedures would also be used to address changes in local, State, or Federal permits that

would result in adverse environmental impacts not considered in the FEIS, ROD, and project record.

- Compliance with the approved MPO is conditional and requires compliance with the terms of the local, State, and Federal permits and authorizations which govern actions that could affect the surface resources on NFS lands. The Coronado and other local, State, and Federal agencies would coordinate with one another to the extent possible with regard to compliance with permits and authorizations. In addition, Rosemont Copper has a legal obligation and financial interest in ensuring that the project is implemented as described in its approved plans and permits. The continuation and ultimate success of the mining venture depends on implementing and coordinating all of the facilities, activities, and personnel in an economically viable and environmentally sound way.
- To accomplish the objective of documenting compliance with permit requirements, a system of self-monitoring and quality assurance/quality control techniques is proposed. To achieve this objective, Rosemont Copper would provide the Coronado with a description of how environmental protection standards contained in approved plans and permits would be implemented. This plan would specify company and consultant personnel who are responsible for performance, inspection, and approval of all work that affects NFS surface resources. Rosemont Copper would designate an environmental coordinator as the primary contact with the Coronado on permit compliance, monitoring, and mitigation. An interagency task force would be formed to administer the approved MPO. The Coronado, ADEQ, Arizona State Mine Inspector, and other regulatory and permitting agencies would be invited to participate on the task force. This group would coordinate project administration to avoid duplication of efforts and ensure that the project is implemented in compliance with their shared authorities and regulations.

Detailed Description of Alternatives

Alternative 1 – No Action

Federal regulation (40 CFR 1502.14(d)) requires consideration of a “no action” alternative. If no action is taken, Rosemont Copper would not develop the Rosemont mineral deposit as described in the MPO submitted for approval (including modifications to date), and all premining exploration and environmental studies on NFS lands would be reclaimed in accordance with laws, regulations, and permits. For the most part, the project area of the Rosemont Copper Project proposed action (figure 8) would continue to grow and develop in accordance with generally accepted social and environmental trends. Information regarding current uses and trends in the project area are described in the “Affected Environment” parts of the resource sections in chapter 3 of this FEIS.

In the absence of the proposed action, current uses of the proposed project area, including the Coronado National Forest, would continue, and new future uses may be proposed. These include mountain biking, hiking, and horseback riding on the Arizona National Scenic Trail; dispersed recreation, such as pleasure driving, hunting, off-highway-vehicle use, camping, bird watching, target shooting, firewood cutting, and other forms of recreation; grazing; and minerals exploration. Off-highway vehicles would continue to use an established parking and unloading area located near Scholefield Canyon. Traditional cultural uses of the project area would continue, including the collection of plants for basket-making, food, and medicinal uses. Access to public land in the area would continue as governed by law, regulation, policy, and existing and future landownership constraints, the latter of which may include denial of access over private land.

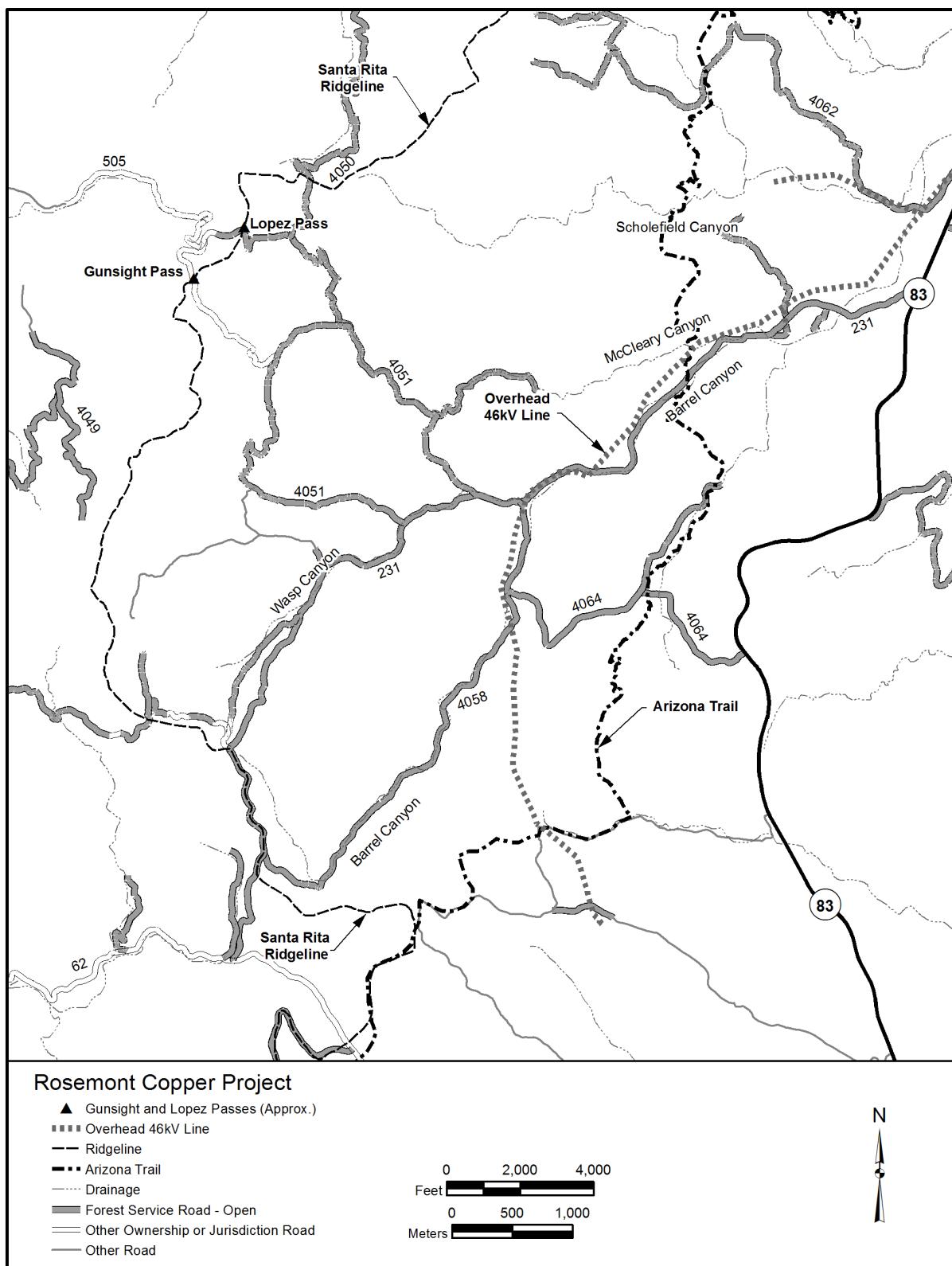


Figure 8. Alternative 1 – No Action

The environment, population, and economy of southeastern Arizona will continue to evolve over time, whether or not the Rosemont Copper Project is implemented. Population growth in Pima County is estimated to be 1.45 million by 2041 (Pima Association of Governments 2012a). The Town of Sahuarita expects its population to increase to 45,597 over a 20-year planning horizon (Town of Sahuarita and General Plan Advisory Committee 2002). The population of Santa Cruz County is expected to reach 60,080 by 2025, an increase of more than 26 percent from the county's 2010 population of 47,420 (Reagor 2008). As populations increase, land and resource uses, including those of the Coronado National Forest, would be expected to increase proportionately. Traffic would likely increase with population growth.

Changes in the climate of the southwestern United States are expected to continue, including an increase in mean annual temperature, a more frequent drought cycle, a decrease in winter precipitation, and an increased frequency of heavy rains and flooding (Southwestern Region Climate Change and Forest Planning Work Group 2010).

The environmental effects of no action are discussed, by resource area, in chapter 3.

Action Alternatives

A description of the action alternatives, which include the proposed action and four action alternatives, follows. This section begins with a general overview of mining operations that applies to all of the action alternatives. Individual alternative descriptions follow that focus on the unique aspects of each alternative.

Table 4 is an overview of the primary differences among the action alternatives evaluated in this EIS. The discussion that follows the table explains each of these differences in detail.

Table 4. Differences among action alternatives evaluated

Element	Proposed Action (preliminary MPO)	Phased Tailings	Barrel (preferred alternative)	Barrel Trail	Scholefield-McCleary
Tailings and waste rock location and landform	Location: McCleary and Barrel drainages Landform: Benched buttress; large, mostly flat surfaces	Location: Barrel drainage and McCleary drainage after 10 years Landform: Wavy benched buttress; large, mostly flat surfaces	Location: Barrel drainage only Landform: Fewer, wider tiers on buttress; large, mostly flat surface	Location: Barrel drainage only Landform: Surface design undulating topography with a designed drainage in the middle	Location: Scholefield and Barrel drainages Landform: Benched buttress; large, mostly flat surfaces
Plant site design	Rectangular ore stockpile building	Round dome ore stockpile	Round dome ore stockpile; no heap leach/solvent extraction/electrowinning processing	Round dome ore stockpile	Round dome ore stockpile

Element	Proposed Action (preliminary MPO)	Phased Tailings	Barrel (preferred alternative)	Barrel Trail	Scholefield-McCleary
Stormwater design	Central drain; divert water into Barrel drainage; drop structures of rock rip-rap	Flowthrough drains; postclosure water storage in basins on top and benches of tailings and waste rock; divert water into Barrel drainage; drop structures of rock rip-rap	No underdrains at all; no water storage on top or benches of tailings and waste rock; divert water into Barrel drainage; drop structures of cement tiles	Flowthrough drains and water flow in manmade canyon to Barrel drainage; water storage on top and benches of tailings and waste rock; drop structures of rock rip-rap	No underdrains; water storage on top and benches of tailings and waste rock; divert water into Barrel and Scholefield drainages; drop structures of rock rip-rap
Soil salvage volume for reclamation	2.8 million cubic yards	2.5 million cubic yards	2.8 million cubic yards	2.9 million cubic yards	712,000 cubic yards
Arizona National Scenic Trail	West of SR 83 with 1 trailhead	West of SR 83 with 1 trailhead	East of SR 83 with 2 trailheads	East of SR 83 with 2 trailheads	East of SR 83 with 2 trailheads
Stormwater design parameters	Most features designed to 100-year, 24-hour event (4.75 inches)	Most features designed to probable maximum precipitation event (15.0 to 18.9 inches) or 500-year, 24-hour event (6.0 inches)	Most features designed to probable maximum precipitation event (15.0 to 18.9 inches) or 500-year, 24-hour event (6.0 inches); bench channels and drop structures designed to 1,000-year, 24-hour event (6.57 inches)	Most features designed to probable maximum precipitation event (15.0 to 18.9 inches) or 500-year, 24-hour event (6.0 inches)	Most features designed to probable maximum precipitation event (15.0 to 18.9 inches) or 500-year, 24-hour event (6.0 inches)

Alternative 2 – Proposed Action in Detail

The proposed action reflects the preliminary MPO that was accepted by the Coronado as sufficient to be evaluated under NEPA. The proposed action, shown in figure 9, includes all the common facilities, processes, and activities described above under “General Overview of Mining Operations.” The only refinement that has been made to this alternative is the approval of the electrical alignment and, with this, the corresponding final water line and utility maintenance road, as described above under “Utility Lines (Electrical and Water Supply).”

Mine Life and Alternative Production Schedule

Mining production plans were developed through the end of year 19 based on proven and probable mineral reserves only. A production schedule was generated, based on the best information available at the time of writing of the preliminary MPO (Huss 2007). Because the mine life considered in the FEIS does not explicitly correlate with the production timing, table 5 provides a crosswalk between the production timing and the mine life used for this analysis.

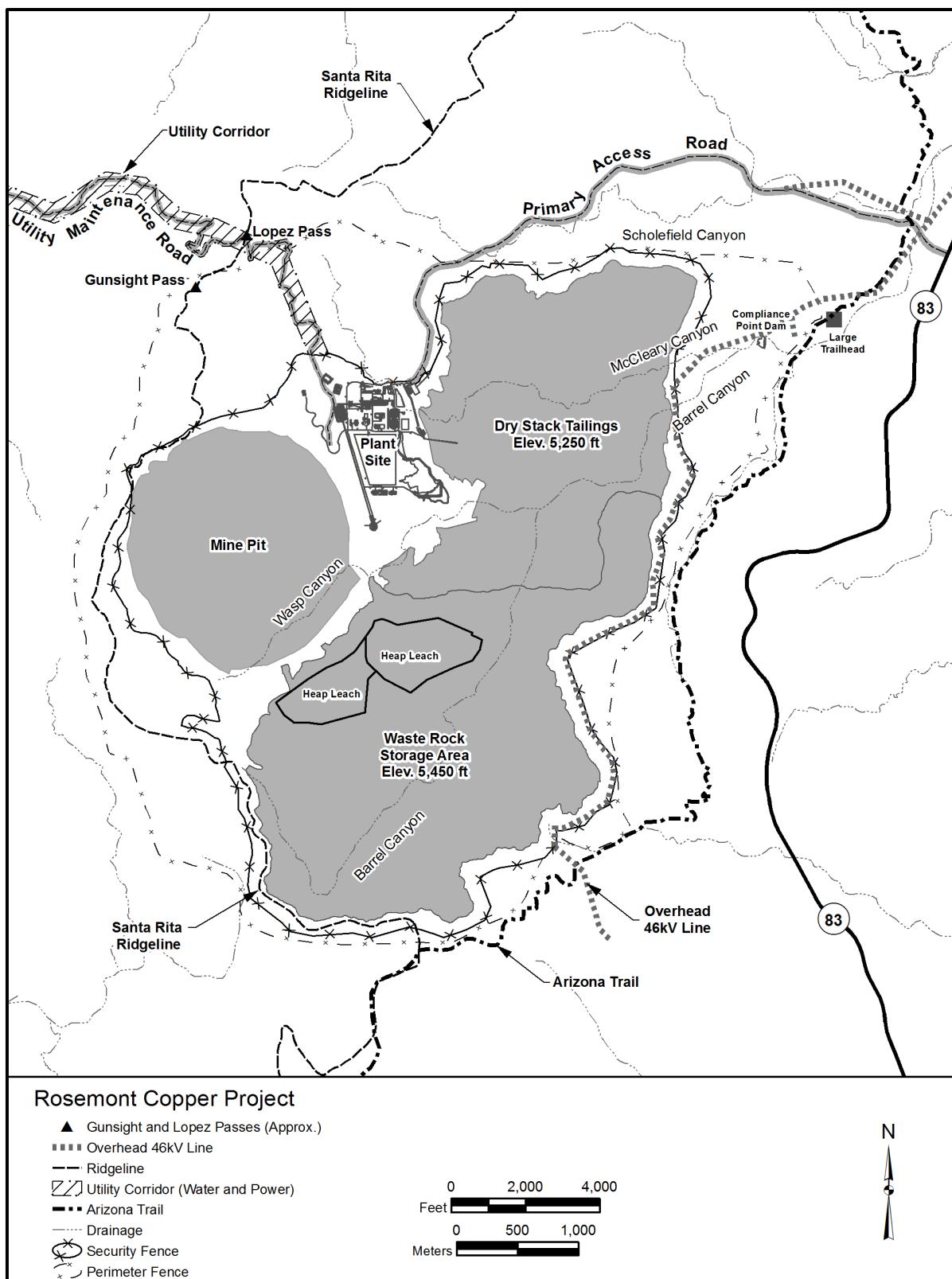


Figure 9. Alternative 2 – Proposed Action footprint

Table 5. Mine life and anticipated production schedule for the proposed action alternative, Rosemont Copper Project

Mine Life Phasing (expected time frame)	Cumulative Timing	Description of Activities	Detailed Timeline for Alternative	Sulfide Ore (1,000 tons)	Oxide Ore (1,000 tons)	Waste Rock (1,000 tons)
Premining (18 to 24 months)	1.5 to 2 years	Clear vegetation; soil stockpile; construct facilities; construct primary access road; construct electrical and water lines and segments of utility maintenance road; construct fences; decommission roads; begin construction of pit; begin construction of perimeter buttress with waste rock; construct monitor wells	Preproduction: 18 months	3,328	14,979	101,293
Active mining (20 to 25 years)	21.5 to 27 years	Continue pit development; continue construction of perimeter buttress; conduct mineral processing; construct tailings facility; perform concurrent reclamation activities (including revegetation); haul products; construct stormwater drainage facilities	Year 1	19,444	18,244	84,286
			Year 2	27,375	5,320	92,305
			Year 3	27,375	937	89,088
			Year 4	27,375	2,602	87,423
			Year 5	27,375	5,002	85,023
			Year 6	27,375	2,195	87,830
			Year 7	27,375	–	90,025
			Years 8 through 10	82,125	166	269,909
			Years 11 through 15	136,875	–	287,195
			Years 16 through 19	86,705	–	14,050
Final reclamation and closure (3 years)	24.5 to 30 years	All mineral processing has been completed; remove plant site facilities; finish reclamation; stain pit walls; finish drainage structures; remove perimeter fence; remove electrical lines on NFS land		Not Applicable		
Total				492,727	49,445	1,288,427

Source: WestLand Resources Inc. (2007a).

Notes: This excludes 3,026,000 tons of stockpiled sulfide ore rehandled in year 1 and 302,000 tons in year 19. In years 8 to 10, 166,000 tons of oxide ore would be waste, as the leach pad would not be available.

The waste rock facility would be constructed south of the tailings facility (see figure 9). It is designed to accommodate approximately 720 million tons of material, with an additional 569 million tons of waste rock dedicated to construction of the perimeter buttress and other facilities. It would cover approximately 2,000 acres. Starting in the first year, waste rock would be placed as a perimeter buttress to partially block the view of the mining area project for travelers on SR 83 and for viewers in the surrounding area. Throughout the life of the mine, waste rock would be disposed of to the west and/or north of (behind) these berms. Waste rock would also be placed to support and armor the outer slopes of the dry-stack tailings facility during the processing of sulfide ore. Construction of the perimeter buttress would be complete approximately 5 years after plant startup. The final elevation of the perimeter buttress would be about 5,475 feet but would step down on the northeast side to between 5,150 and 5,050 feet to tie in with the dry-stack tailings and oxide heap leach facilities.

The height of the waste rock facility would vary, ranging from 100 to 400 feet above the ground surface, depending on existing topography. Prior to disposal of waste rock, undisturbed areas would be cleared and grubbed, and soil usable for growth media would be salvaged for active or future reclamation. The outer slopes of the waste rock facility, from toe to crest, would be approximately 4:1 (horizontal: vertical). Growth media would then be spread across the surface, seeded, fertilized, and managed as necessary to promote revegetation of the waste rock facility. Reclamation of these areas would be conducted concurrently with active mining. All growth media is expected to be salvaged from the site. No mechanical manipulation of the salvaged soil or creation of soil by crushing waste rock has been proposed. Soil has not been proposed to be salvaged from any areas that would not ultimately be disturbed by the mine operations, and no offsite borrow pits are planned.

Waste rock disposal would be restricted to a single surface water drainage basin, the Barrel Canyon area, which includes the tributaries of the Wasp and McCleary drainages. The tops of the waste rock facility would be sloped to direct stormwater away from the crest of the perimeter buttress. Stormwater would ultimately directed to a sediment control structure (compliance point dam) located to the northeast of the dry-stack tailings facility. This sediment control structure would be the final testing and control point for stormwater discharge to the lower Barrel Canyon drainage.

Dry-Stack Tailings Facility

The proposed action incorporates a waste rock perimeter buttress that would completely surround the dry-stack tailings and heap leach facilities. The dry-stack tailings facility would be divided into two separate units, north and south, which would be separated by a stormwater control facility (the central drain). The north stack would be constructed from years 1 through 14 and the south stack from years 15 through 19. The dewatered tailings would be deposited by a mechanical stacker and moved and compacted as needed by a bulldozer. The outer slopes of the dry stack would be contained and armored with benched waste rock buttresses that would be no less than 150 feet wide and that would have an overall crest-to-toe slope of 3.5:1 (horizontal: vertical). Slopes would be 3:1 between benches. The central drain, described below, would be constructed of waste rock selected for size and chemical inertness and would function to collect and route stormwater from both on top and upstream of the tailings facility.

Plant Site

The plant site would be located between the pit and the north end of the tailings facility. The specific layout of plant site facilities in this alternative differs from the other alternatives (figure 10). The coarse ore stockpile—as proposed in the preliminary MPO, which describes the proposed

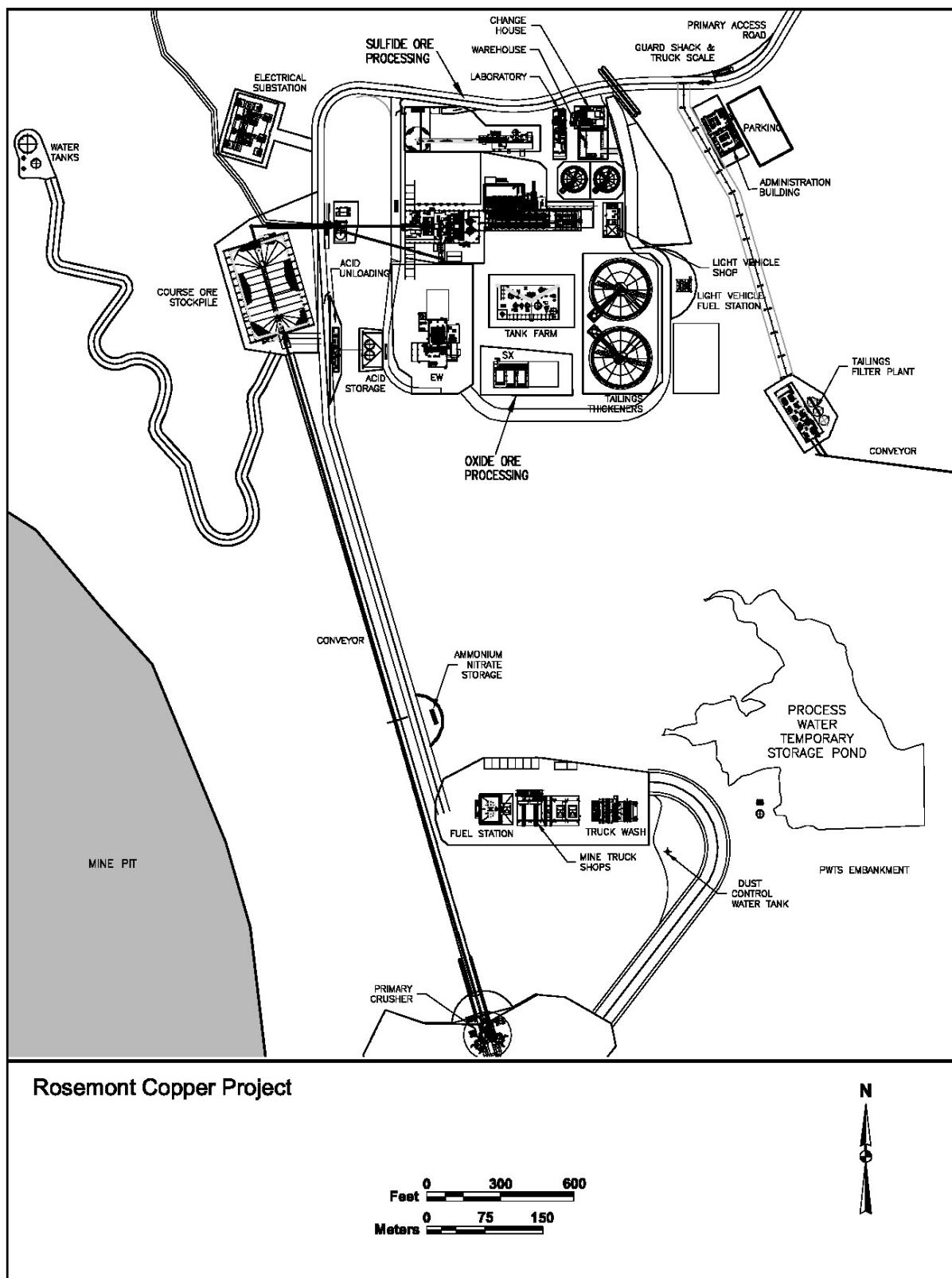


Figure 10. Layout of plant facilities under the proposed action

action—would be a rectangular building with the appropriate conveyors going to and from the building.

Stormwater Controls

The central drain is associated only with the proposed action and would be a rock chimney drain located between the north and south tailings facilities. It is designed to route excess stormwater through the tailings facility from both upstream and on top of the dry-stack tailings facility and ultimately to the compliance point dam in Barrel Canyon. Stormwater from the waste rock buttresses of the dry-stack tailings facility would be combined with stormwater from the waste rock facility for reuse or discharge downstream after passing through the final compliance pond (figure 11).

Over time, the north tailings facility would expand to the south and east and would cover a portion of the Barrel Canyon drainage. The north diversion would then be extended in the natural drainage as a porous rock drain (central drain), and waste rock would be stacked over the top of the rock drain material. An upstream impoundment, the attenuation pond, would collect surface runoff and slowly feed stormwater into the central drain. The central drain design is based on placement of clean, competent rock to allow conveyance of the 100-year, 24-hour storm event volume from the contributing basin through the drain within 30 days. The drain is sized to provide a 30-foot-high drain across the streambed, which is approximately 300 feet wide. Select waste rock would be placed above the 30-foot-high portion of the drain to extend the drain upward as the tailings facility is advanced. The concept of the central drain was removed from all other action alternatives.

Other diversion channels around the plant site are sized to handle runoff from the 100-year, 24-hour storm event (equal to 4.75 inches of rain over a 24-hour period).

Phasing of Concurrent Reclamation

The general concept behind concurrent reclamation, as presented in the “Reclamation and Closure Plan” from July 2007, was to ultimately create a “Rosemont Ridge” landform, housing the waste rock and tailings (Tetra Tech 2007d). The eastern most edge of the waste rock perimeter buttress would be constructed early in the active mining phase in an attempt to shield the view of main portions of the plant and other operations. Reclamation progress on the perimeter buttress would be made during active mining; waste rock and tailings would be piled behind the buttress. The volume of soil that can be salvaged from the site in order to be used later for cover during reclamation activities is estimated at 2.8 million cubic yards. The final ridge would have outer slopes ranging from 3:1 to 3.5:1, with slope heights of about 600 feet (Tetra Tech 2007d). Descriptions of the landform and its visual aspects are provided in the “Visual Resources” section of chapter 3.

Arizona National Scenic Trail and Area Roads

The Arizona National Scenic Trail would be realigned just outside the perimeter fence with a trailhead that would be located off of the primary access road, as shown in figure 9. Area roads that are outside the perimeter fence that would either be reconnected or decommissioned are shown in figure 12. The Sycamore Connector Road is about 3,432 feet long and impacts about 7 acres. Specific information pertaining to the effects of “Alternative 2 – Proposed Action” is summarized at the end of this chapter.

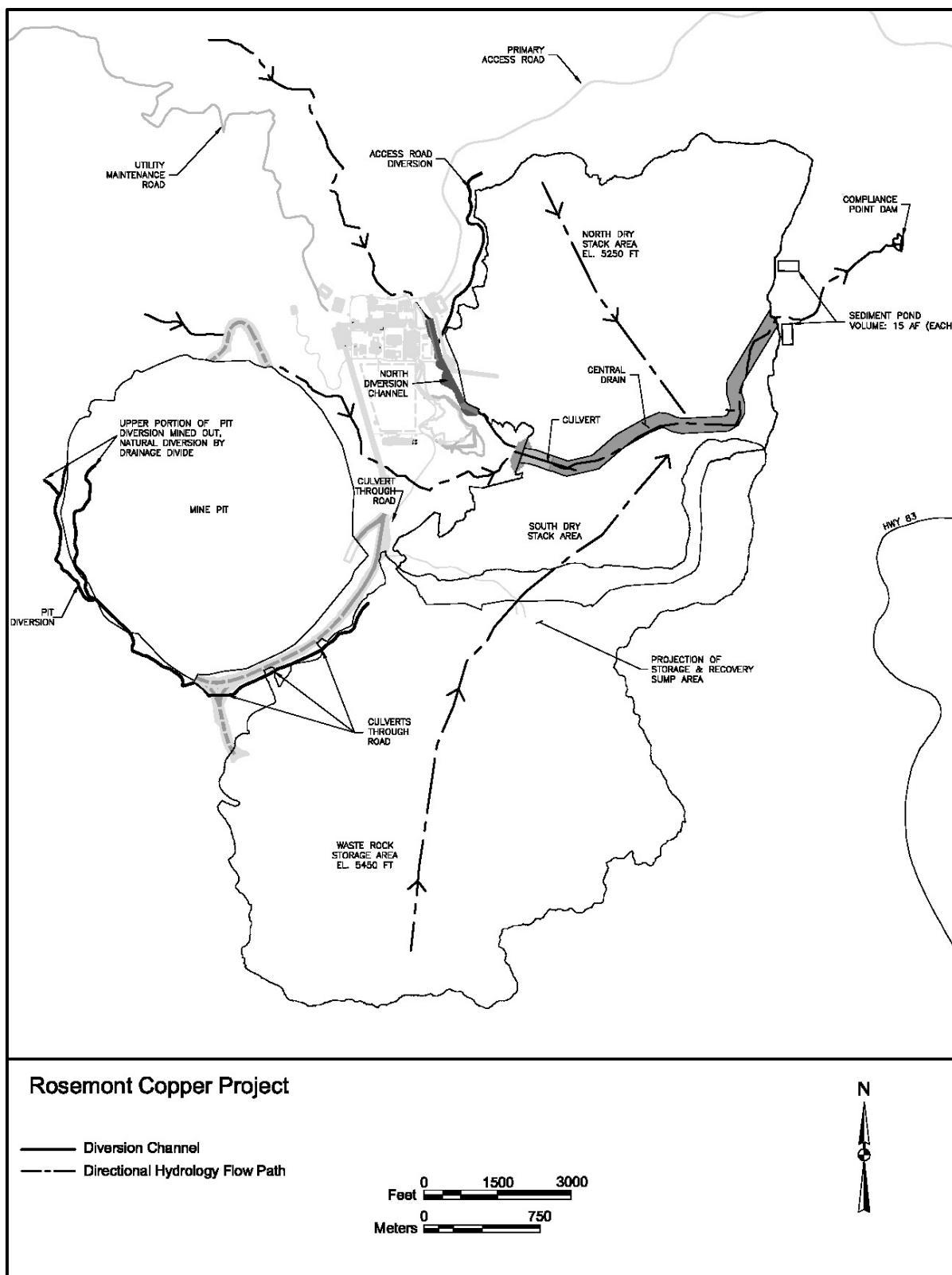


Figure 11. Stormwater control concept under the proposed action

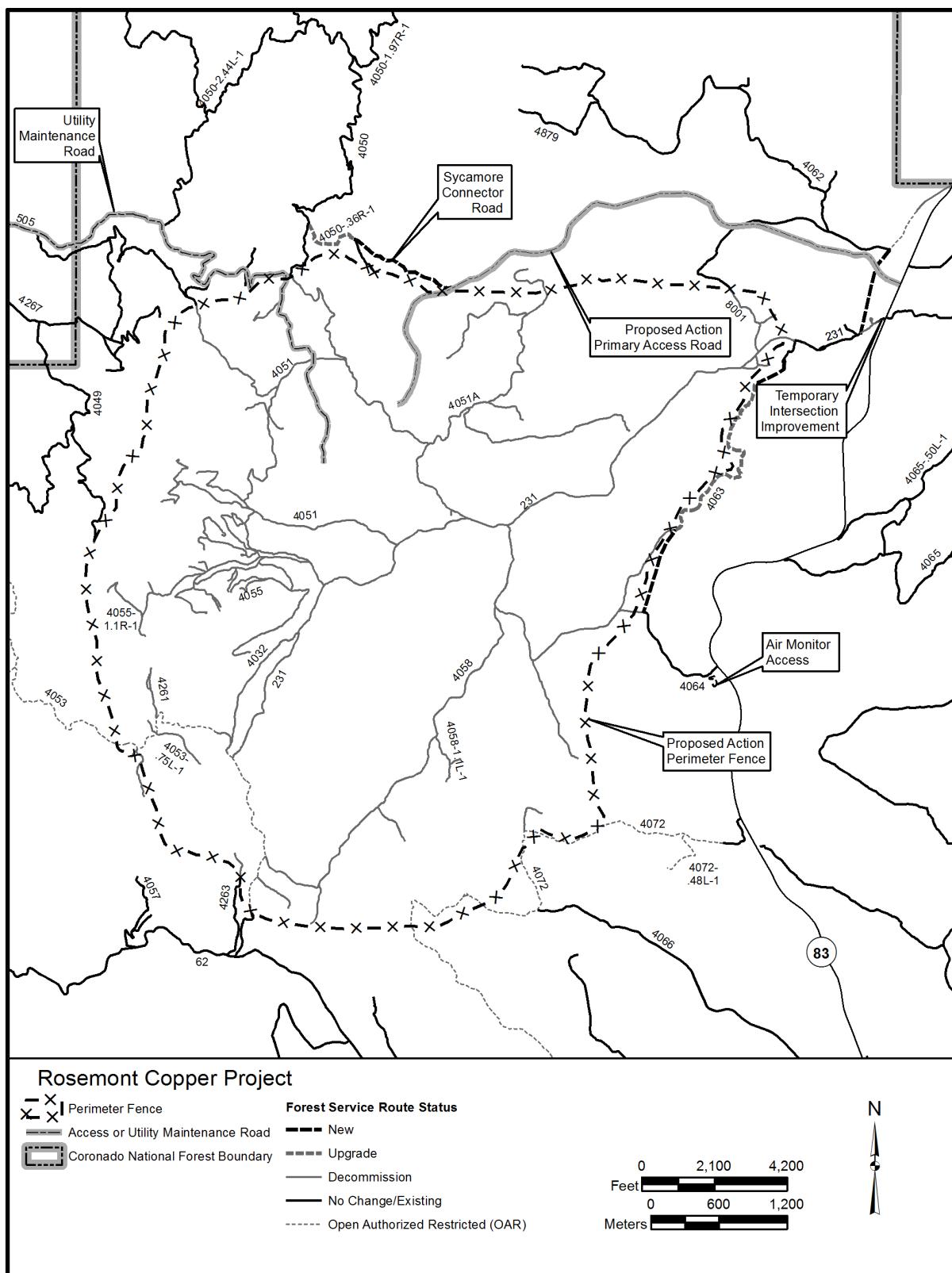


Figure 12. Road changes under the proposed action

Alternative 3 – Phased Tailings Alternative in Detail

Specific Elements of the Phased Tailings Alternative

The Phased Tailings Alternative was developed to respond to significant issues regarding potential negative effects of the proposed action on water and visual resources. Alternative 3 (figure 13) contains a number of features in common with the proposed action. However, several features have been modified and designed to better respond to the issues mentioned. These include the following:

- Reversing the phased placement of the dry-stack tailings to leave the McCleary Canyon drainage open for approximately 10 years longer;
- Refining the plant site, including redesigning the coarse ore stockpile to a dome structure and associated conveyor;
- Realigning the primary access road to avoid Scholefield Canyon; and
- Redesigning the stormwater management.

Mine Life and Alternative Production Schedule

Mining production plans were developed through the end of year 21 based on proven and probable mineral reserves only. A production schedule was generated based on the best available information at the time of writing of the DEIS (Huss 2009). Because the mine life considered in the FEIS does not explicitly correlate with the production timing, table 6 provides a crosswalk between the production timing and the mine life used for this analysis.

However, at the end of mine life, the final waste rock and tailings facilities would occupy the same location as the proposed action. This would reduce the short-term impact on surface water flow by allowing the McCleary Canyon drainage to remain open for approximately 10 years longer than it would under the proposed action.

Primary Access Road

The primary access road was redesigned to follow a revised alignment that both shortens the road and reduces its visibility from SR 83. This realignment avoids Scholefield Canyon and would reduce impacts to riparian vegetation and cultural resources. The new alignment intersects SR 83 at the same location as in the proposed action but is 3.2 miles long, as shown in figure 13.

Plant Site

While the location of the plant site would be the same as that of the proposed action, the Phased Tailings Alternative relocates some facilities to address geotechnical concerns regarding differential settlement (figure 14). These modifications also provide secondary containment opportunities for process solutions, where possible, should there be interrupted operations, and add stormwater catchments, where necessary. The Phased Tailings Alternative adds a double liner with a leak collection and removal system to the process water temporary storage pond and improves the containment of process water and separation of process water from stormwater. In addition, the Phased Tailings Alternative modifies the design of the coarse ore stockpile to a 400-foot covered geodesic dome structure and associated conveyor systems, to avoid encroaching on a population of the Forest Service sensitive plant species *Hexalectris colemani*, a wild orchid.

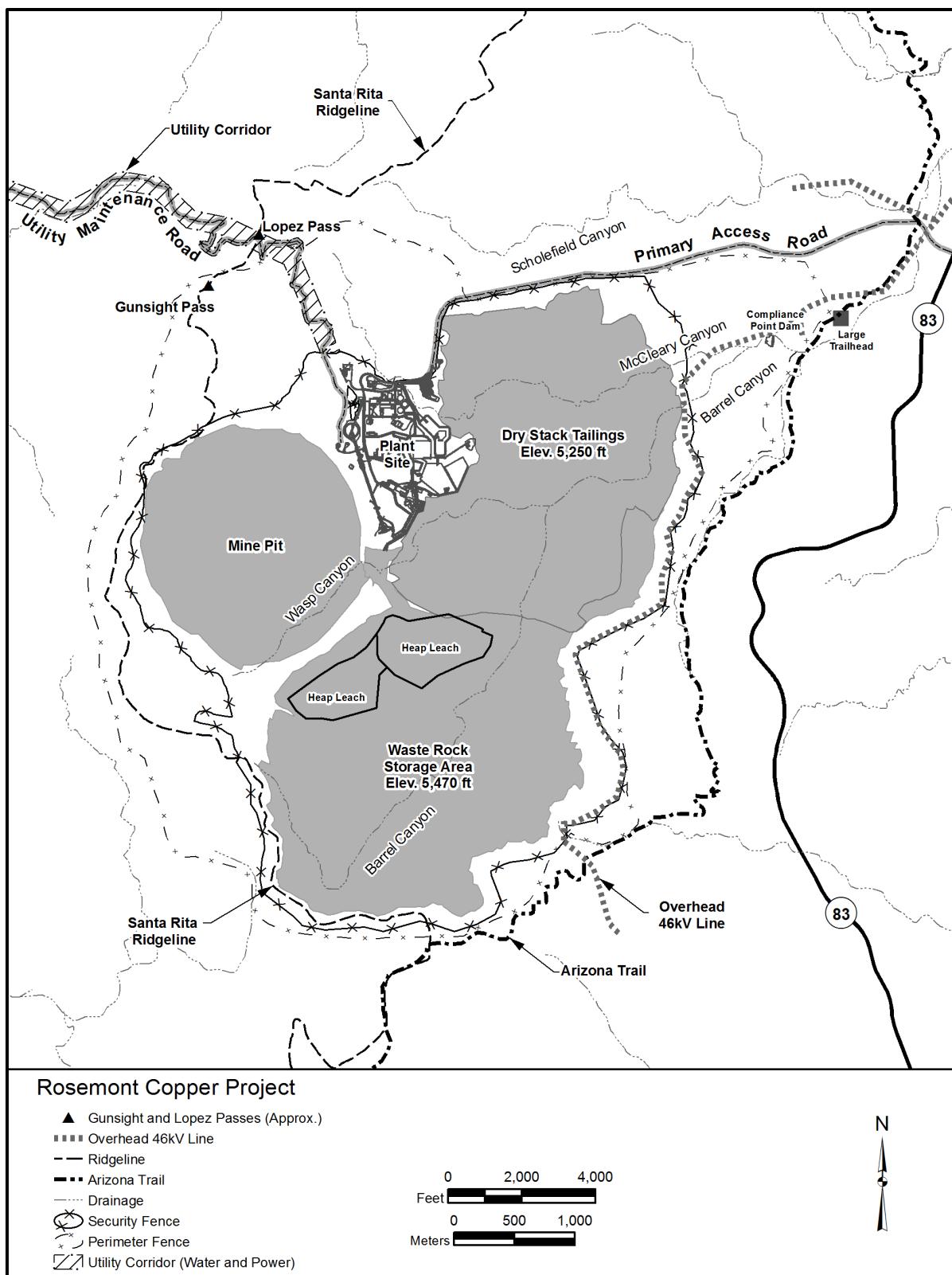


Figure 13. Alternative 3 – Phased Tailings Alternative footprint

Table 6. Mine life and anticipated production schedule for the Phased Tailings Alternative

Mine Life Phasing (expected time frame)	Cumulative Timing	Description of Activities	Detailed Timeline for Alternative	Sulfide Ore (1,000 tons)	Oxide Ore (1,000 tons)	Waste Rock (1,000 tons)
Premining (18 to 24 months)	1.5 to 2 years	Clear vegetation; stockpile soil; construct facilities; construct primary access road; construct electrical and water lines and segments of utility maintenance road; construct fences; decommission roads; begin construction of pit; begin construction of perimeter buttress with waste rock; construct monitor wells	Preproduction: 15 months	—	8,647	63,917
Active mining (20 to 25 years)	21.5 to 27 years	Continue pit development; continue construction of perimeter buttress; conduct mineral processing; construct tailings facility; perform concurrent reclamation activities (including revegetation); haul products; construct stormwater drainage facilities	Year 1	22,475	20,674	72,822
			Year 2	27,376	14,751	72,243
			Year 3	27,375	9,629	72,369
			Year 4	27,375	3,901	78,094
			Year 5	27,375	1,821	80,177
			Year 6	27,375	9,758	71,241
			Year 7	27,375	—	81,997
			Years 8 through 10	82,125	—	245,491
			Years 11 through 15	136,875	—	339,995
			Years 16 through 19	140,612	—	53,911
Final reclamation and closure (3 years)	24.5 to 30 years	All mineral processing has been completed; remove plant site facilities; finish reclamation; stain pit walls; finish drainage structures; remove perimeter fence; remove electrical lines on NFS land		Not Applicable		
Total				546,338	69,181	1,232,257

Source: Huss (2009).

Notes: Includes stockpiled sulfide ore rehandled. After year 7, 793,000 tons of oxide ore may be waste, as the leach pad would not be available.

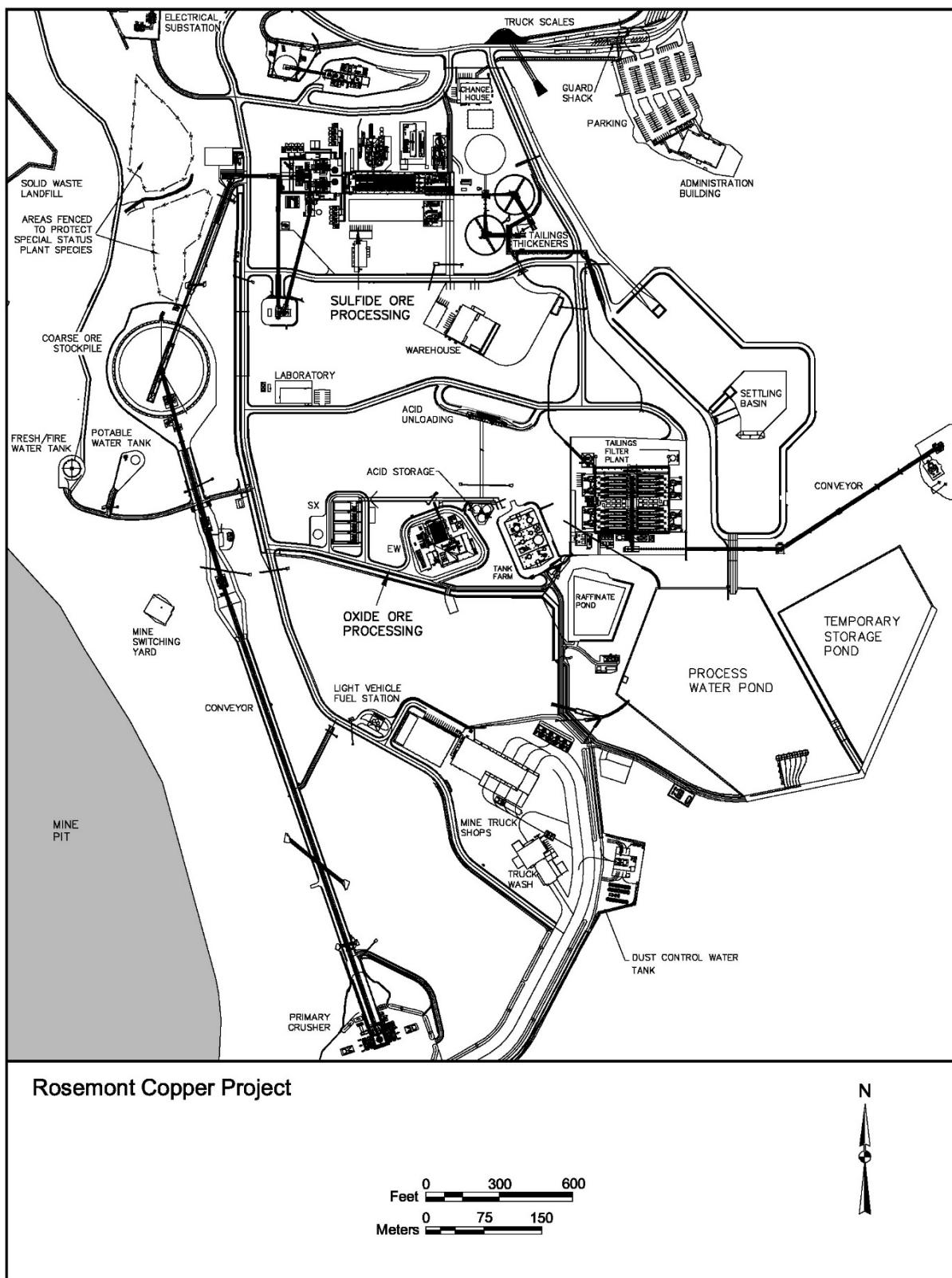


Figure 14. Phased Tailings Alternative plant site

Stormwater Controls

The process water temporary storage pond is divided into two containments, one for process water and one for temporary storage of plant site runoff and any overflow from the process water containment. The redesigned process water pond has a double liner with leak collection and removal system over a geosynthetic clay liner, and the temporary storage pond has a single liner over ageosynthetic clay liner. A settling basin upstream of the process water containment has been included to provide containment for tailings settlement, if necessary, and to allow excess water to flow into the process water pond. Additionally, the leaching system barren solution pond was relocated upgradient of the process water pond to provide containment opportunities.

In addition, the Phased Tailings Alternative includes a minimum 20-foot-thick final cap of waste rock atop the heap leach, rather than the 50-foot minimum cap specified by the proposed action. A cap of 20 feet is considered sufficient as long as ponding is not occurring above the heap leach. This thickness should afford reasonable infiltration resistance (mostly by retaining the intermittent infiltration in the near-surface soil, where it can wick back to the surface and evaporate following a storm event). It should be noted that discharge from the heap both during operations and postclosure is regulated by the ADEQ. Precipitation recharge is not modeled to occur; however, precipitation recharge could lead to an environmental impact without actually causing a violation of Rosemont Copper's aquifer protection permit. Such an impact, under the aquifer protection permit, could require Rosemont Copper to implement a remedial action plan in order to prevent a permit violation.

A series of flowthrough drains beneath the tailings and waste rock facilities would replace the central drain and attenuation pond of the proposed action. The flowthrough drains, which are rock drain structures placed in the natural drainage channels, are designed to pass stormwater beneath the tailings and waste rock facilities. They are part of the overall stormwater diversion system. Concerns have been raised by cooperating agencies about the long-term maintenance of proposed flowthrough drains. These concerns were evaluated as part of a peer review process undertaken for the site water management plans prepared by Rosemont Copper. Reviewing experts were satisfied that the proposed flowthrough drains would operate as expected during operations (Annandale 2011). Rosemont Copper had proposed postclosure designs intended to allow for long-term removal of sediments in order to prevent sedimentation within the drains (O'Brien and Ridlen 2011b). Reviewing experts were not entirely comfortable with these designs and indicated that maintenance after closure could be required (Annandale 2011). These concerns would apply to all alternatives, except for the Barrel Alternative. Flowthrough drains were removed from Barrel Alternative due to concerns over long-term maintenance.

The Phased Tailings Alternative completely redesigns the diversion and stormwater management system from that of the proposed action and incorporates more conservative design criteria to reduce the potential for failure during unusually high precipitation events. Most diversion channels and detention basins under this alternative are designed to accommodate the probable maximum precipitation storm event (equal to 15.0 to 18.9 inches of rain).

Figure 15 shows the mine layout for the Phased Tailing Alternative, which incorporates diversion channels and detention basins on the mine site; channels, detention basins, and drop structures on the waste rock perimeter buttress of the tailings facility; and flowthrough drains, including the design storm event used in the design of each facility. Unlike the proposed action, both during operations and postclosure, stormwater would be stored on top and on the benches of the waste rock and tailings facilities and would not be discharged downstream except in extreme events.

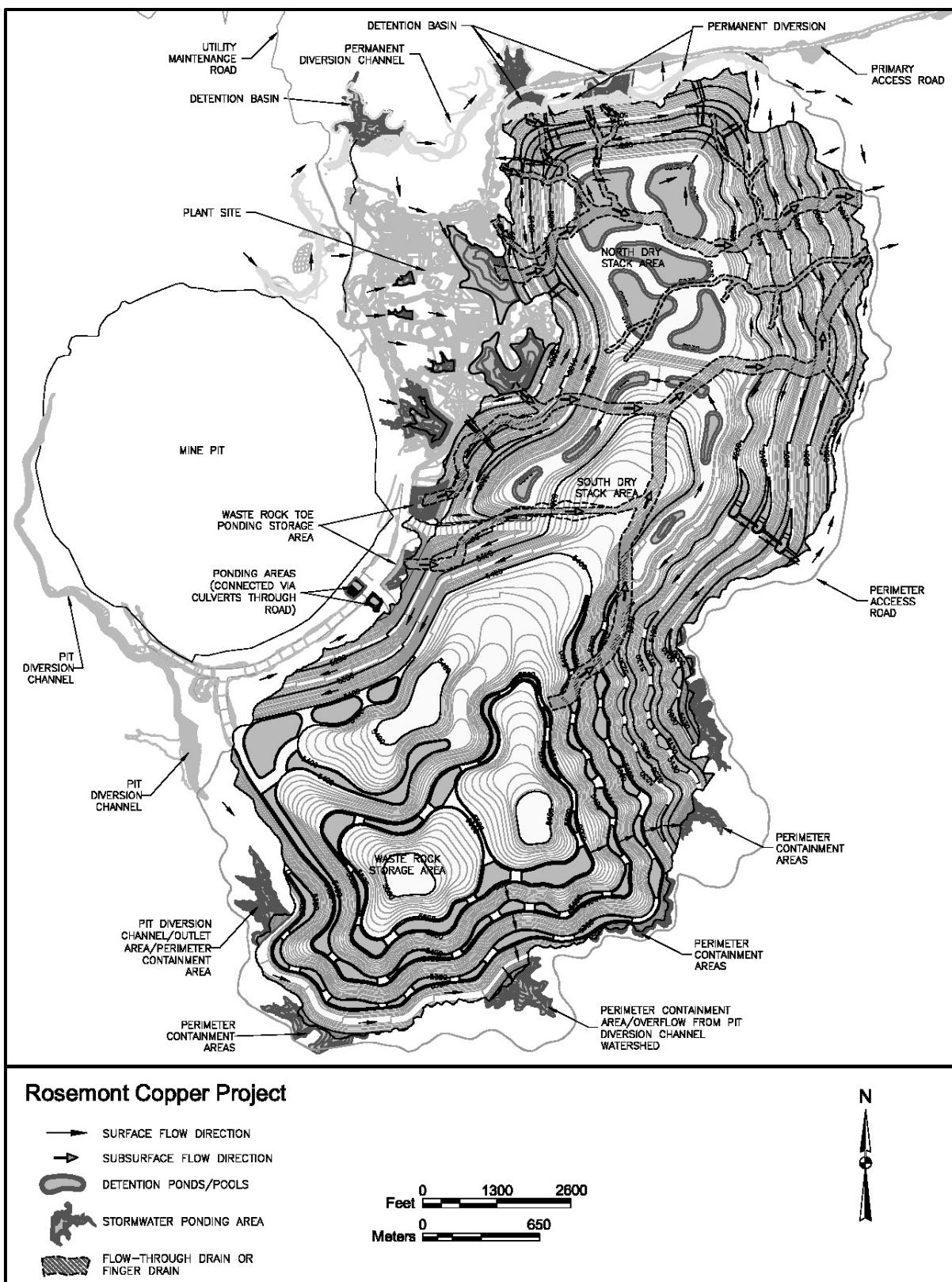


Figure 15. Phased Tailings Alternative stormwater control concept

While concurrent reclamation is planned, it would not facilitate stormwater passing downstream, except in extremely large storm events, as the design calls for ponding of water on the benches and top of the waste rock/tailings landform. The stormwater storage basins on the top and benches of the waste rock facility are designed to store the 500-year, 24-hour storm event (equal to 6.0 inches of rain). The stormwater storage basins on the top of the closed tailings facility are designed to store the 1,000-year, 24-hour storm event (equal to 6.57 inches of rain). Runoff from the plant site and the diversion west of the open pit would also be retained. This alternative would maintain flow from above the plant site by diverting it into upper McCleary Canyon both during operations and postclosure.

Phasing of Concurrent Reclamation

The general concept of concurrent reclamation and the “Rosemont Ridge” specifications carry over into the objective for the Phased Tailings Alternative. However, because this alternative would not encroach on the McCleary drainage for the tailings facility until around year 10, those portions would not begin reclamation until reclamation of other portions of the tailings and waste rock facilities had long been underway. The volume of soil that can be salvaged from the site to be used later for cover during reclamation activities is estimated at 2.5 million cubic yards.

Also, accommodations for sequencing and tonnage were made in the landform. The expanded Rosemont Ridge landform raises the south dry-stack tailings facility by 160 feet and the north dry-stack tailings facility by 60 feet (Tetra Tech 2010f), compared with the proposed action.

Arizona National Scenic Trail and Area Roads

The Arizona National Scenic Trail would be realigned just outside the perimeter fence with a trailhead that would be located off of the primary access road, as shown in figure 13. Area roads that are outside the perimeter fence that would either be reconnected or decommissioned are shown in figure 16. The Sycamore Connector Road is about 12,184 feet long and impacts about 26 acres. Specific information pertaining to the effects of “Alternative 3 – Phased Tailings Alternative” is summarized at the end of this chapter.

Alternative 4 – Barrel Alternative in Detail (Preferred Alternative)

The Forest Supervisor has identified the Barrel Alternative as the preferred alternative.

Since the release of the DEIS, there have been modifications to the Barrel Alternative in response to public comments and agency efforts toward geomorphic reclamation. Geomorphic reclamation involves the incorporation of postclosure landforms that replicate natural drainages, both functionally and visually. Through an iterative refinement process for this alternative, Rosemont Copper was directed to work within the project footprint developed by the Coronado ID team. After further construction planning by Rosemont Copper, it became clear that this alternative could not be constructed according to the necessary phasing and still retain the heap leach facility with enough surface area to make the oxide ore processing economically feasible. In response to both public and other agency concerns about the heap leach facility and economic feasibility concerns, Rosemont Copper recommended removing oxide ore processing from the Barrel Alternative. After careful consideration, the Forest Supervisor decided to adopt their recommendation and remove oxide ore processing from this alternative. See “Removal of Heap Leach Facility from the Barrel Alternative” earlier in this chapter for more details.

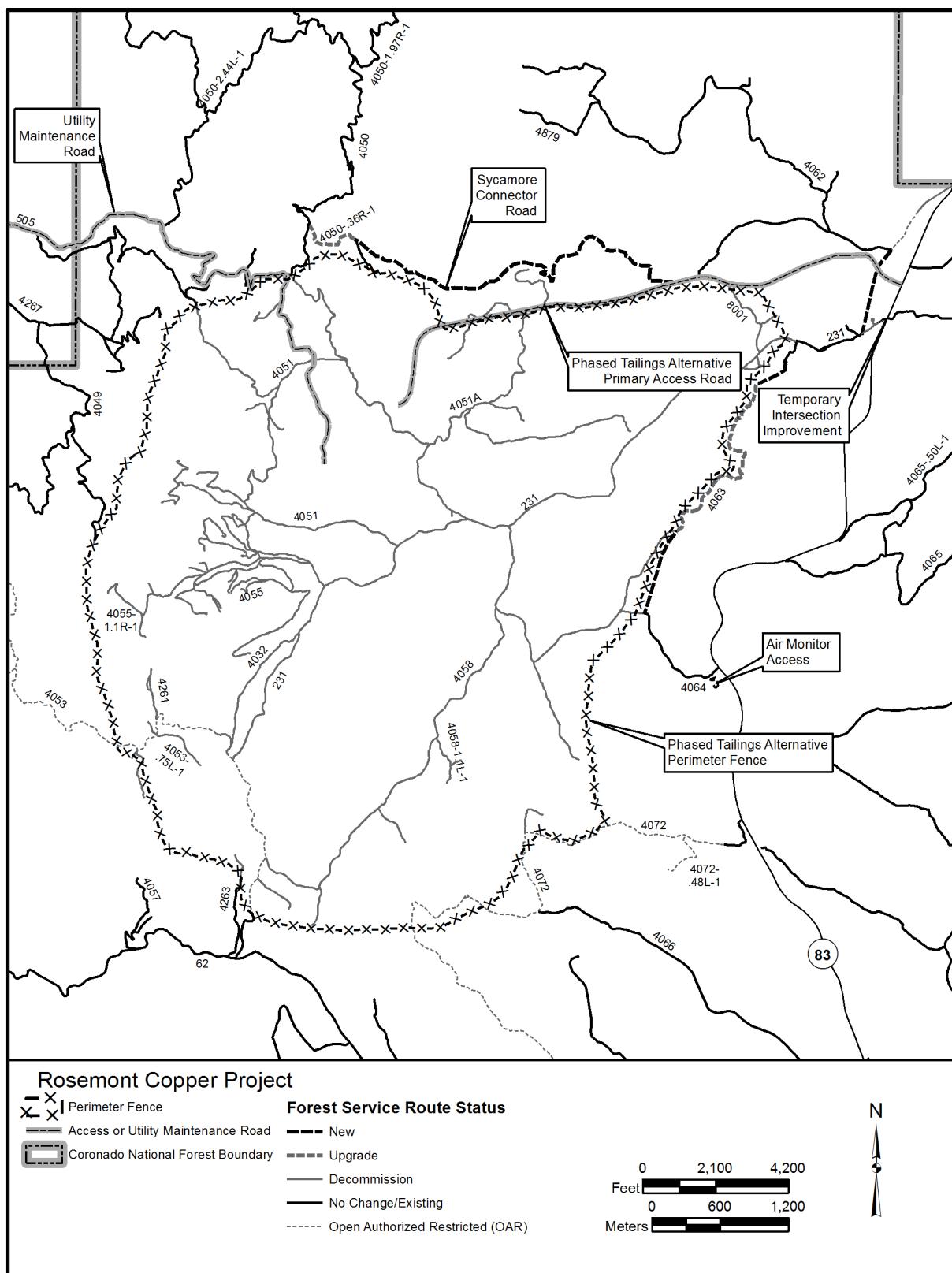


Figure 16. Road changes under the Phased Tailings Alternative

Additional refinements to this alternative include the following:

- Inclusion of rock cover as part of reclamation on the east slope of tailings and waste rock facilities to promote long-term stability;
- Stormwater redesign, including removing the underdrains, eliminating storage on the top and benches of the tailings and waste rock facilities, and incorporating more stormwater routing downstream;
- Relocation of the Arizona National Scenic Trail to the east side of SR 83; and
- Elimination of oxide ore processes, including the heap leach facility.

Specific Elements of the Barrel Alternative

The Barrel Alternative (figure 17) was developed to respond to significant issues regarding potential impacts on biological resources, cultural resources, and the surface water component of water resources.

Mine Life and Alternative Production Schedule

Mining production plans were developed through the end of year 21.3 based on proven and probable mineral reserves only. A production schedule was generated based on the best available information at the time of writing of the FEIS (M3 Engineering and Technology Corporation 2012). Because the mine life considered in the FEIS does not explicitly correlate with the production timing, table 7 provides a crosswalk between the production timing and the mine life used for this analysis.

Waste Rock and Tailings Facilities

The Barrel Alternative would place all of the tailings and waste rock in upper Barrel Canyon and the lower portion of Wasp Canyon, prohibiting disposal of mine tailings or waste in McCleary Canyon. This change would permanently maintain its contribution of surface water flow to the Barrel Canyon drainage system, albeit in a somewhat decreased capacity during operations because runoff from the plant site would be required to be retained. It would also increase the drainage area that may be diverted through the McCleary Canyon channel, in contrast to the proposed action and the Phased Tailings Alternative.

Like the other action alternatives, the Barrel Alternative incorporates a waste rock perimeter buttress that would completely surround the dry-stack tailings.

Primary Access Road

The primary access road from SR 83 would be the same as under the Phased Tailings Alternative.

Plant Site

The plant site is similar to that of the Phased Tailings Alternative, except that the Barrel Alternative plant site does not include the oxide ore processing buildings and instead uses that land for materials laydown yards, as shown in figure 18.

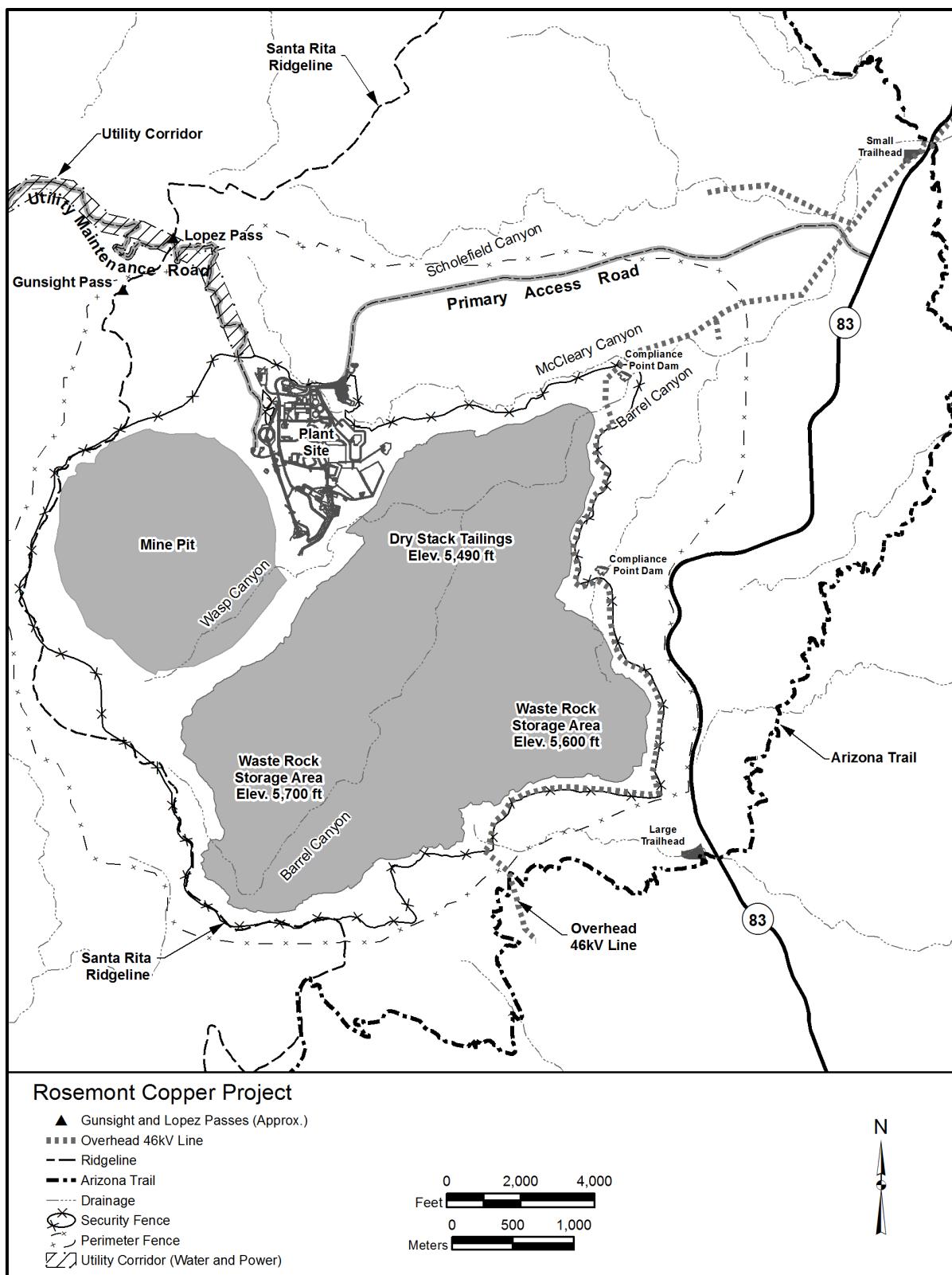


Figure 17. Alternative 4 – Barrel Alternative footprint

Table 7. Mine life and anticipated production schedule for the Barrel Alternative

Mine Life Phasing (expected time frame)	Cumulative Timing	Description of Activities	Detailed Timeline for Alternative	Sulfide Ore (1,000 tons)	Waste Rock (1,000 tons)
Premining (18 to 24 months)	1.5 to 2 years	Clear vegetation; stockpile soil; construct facilities; construct primary access road; construct electrical and water lines and segments of utility maintenance road; construct fences; decommission roads; begin construction of pit; begin construction of perimeter buttress with waste rock; construct monitor wells	22 months	6,259	98,859
Active mining (20 to 25 years)	21.5 to 27 years	Continue pit development; continue construction of perimeter buttress; conduct mineral processing; construct tailings facility; perform concurrent reclamation activities (including revegetation); haul products; construct stormwater drainage facilities	Year 1	27,920	88,169
			Year 2	35,576	69,944
			Year 3	42,628	82,165
			Year 4	27,375	95,980
			Year 5	32,015	74,569
			Year 6	34,348	63,412
			Year 7	37,373	62,094
			Years 8 through 10	96,360	269,243
			Years 11 through 15	163,520	260,736
			Years 16 through 19	204,097	83,996
Final reclamation and closure (3 years)	24.5 to 30 years	All mineral processing has been completed; remove plant site facilities; finish reclamation; stain pit walls; finish drainage structures; remove perimeter fence; remove electrical lines on NFS land	Not Applicable		
Total				707,471	1,249,161

Source: M3 Engineering and Technology Corporation (2012).

Note: Totals for sulfide ore include stockpiled ore.

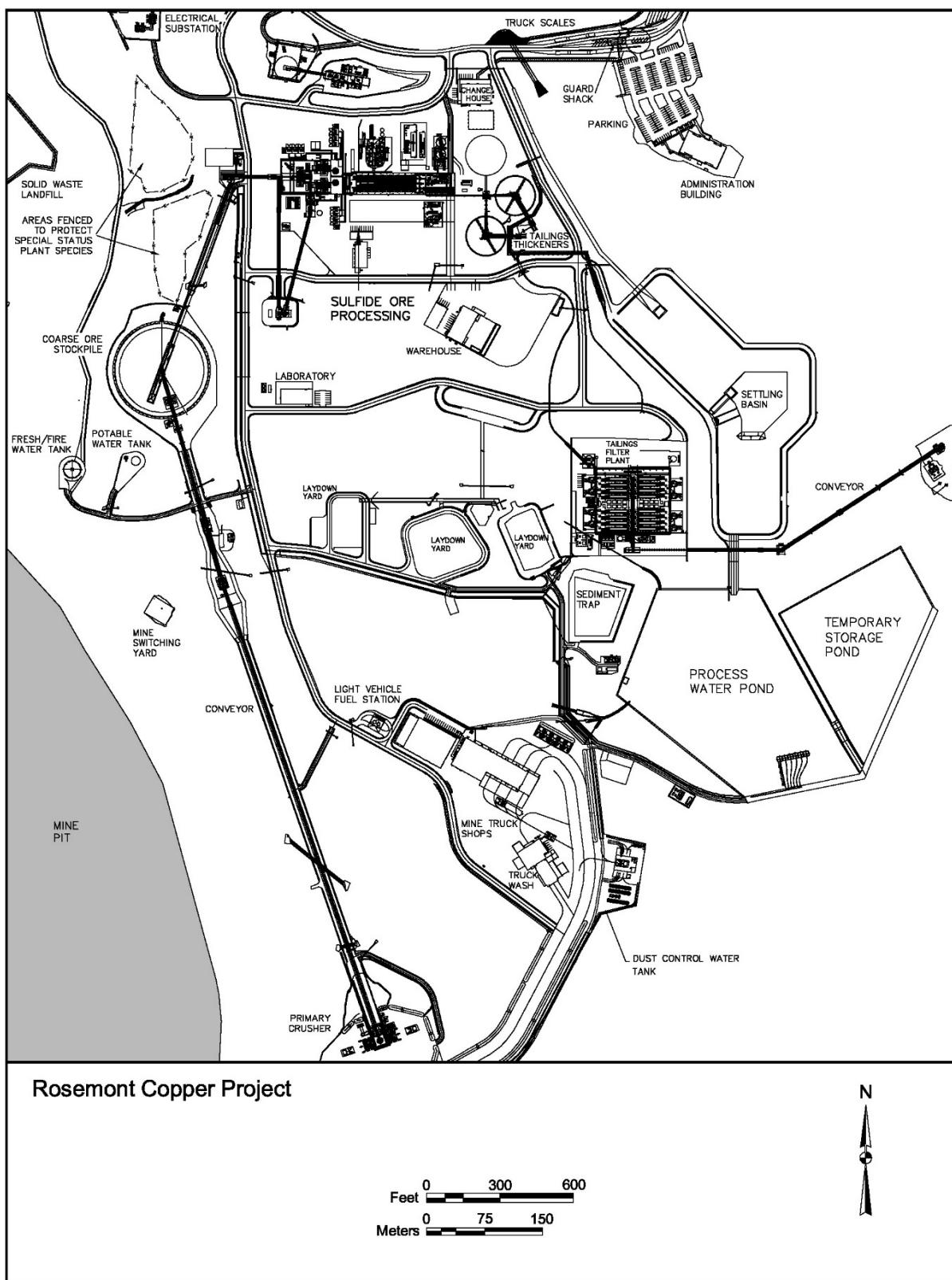


Figure 18. Barrel Alternative plant site

Stormwater Controls

During operations, several areas would not discharge downstream. Runoff in the vicinity of the pit itself would be retained in the pit postclosure; pumped and used as process water during active mining; or, prior to development of the pit, retained in stormwater ponds. Runoff from the plant site would be retained in stormwater or process ponds and recycled as process water. Runoff from tailings facilities, prior to concurrent reclamation, would also be retained in various ways and would not be allowed to discharge. Occasionally, tailings runoff would necessarily be stored on top of the tailings facility during operations; this water could be actively pumped off and recycled as process water.

Unlike the Phased Tailings Alternative, the Barrel Alternative permits no storage of stormwater on the top or benches of the waste rock/tailings landform postclosure. Instead, waste rock and tailings facilities would shed runoff after closure. The tops of the facilities would be graded to discharge stormwater to the lower benches, which in turn are designed to move stormwater laterally along the benches until it reaches several concrete drop structures. The runoff from these drop structures would either be discharged into the natural washes (Barrel Canyon or a tributary) or discharged into a diversion channel that would carry runoff along the toe of the waste rock and tailings facilities and then would discharge that runoff into the natural washes (figure 19). In this manner, as much water as possible would be allowed to flow downstream after reclamation is complete.

The flowthrough drains beneath the tailings and waste rock facilities are not part of the Barrel Alternative because of concerns about intermingling of stormwater and tailings seepage and long-term maintenance. Postclosure, stormwater from the former plant site would instead be diverted to flow into McCleary Canyon via a surface channel.

Because the heap leach facility has been eliminated for this alternative, there would be no waste rock cover for the facility, as described under the other action alternatives.

Phasing of Concurrent Reclamation

In order to maintain concurrent reclamation of final outer slopes, waste rock would initially be placed in berms along the outside edge of the waste rock facility, followed by waste rock and tailings placement behind the berms. A large portion of the waste rock perimeter buttresses that surround the tailings facility and the waste rock facility itself would be concurrently reclaimed by year 10; these areas would begin to discharge water downstream as reclamation is completed. The upper benches and tops of the waste rock and tailings facilities would be reclaimed beginning in year 16 but would not be completely reclaimed until the mine is fully closed. The volume of soil that can be salvaged from the site to be used later for cover during reclamation activities is estimated at 2.8 million cubic yards.

Arizona National Scenic Trail and Area Roads

The Arizona National Scenic Trail alignment analyzed as part of this alternative is different from that under the proposed action and Phased Tailings Alternative. It is located east of SR 83, as shown in figure 17. Area roads that are outside the perimeter fence that would either be reconnected or decommissioned are shown in figure 20. The Sycamore Connector Road is about 12,184 feet long and impacts about 26 acres. Specific information pertaining to the effects of “Alternative 4 – Barrel Alternative” is summarized at the end of this chapter.

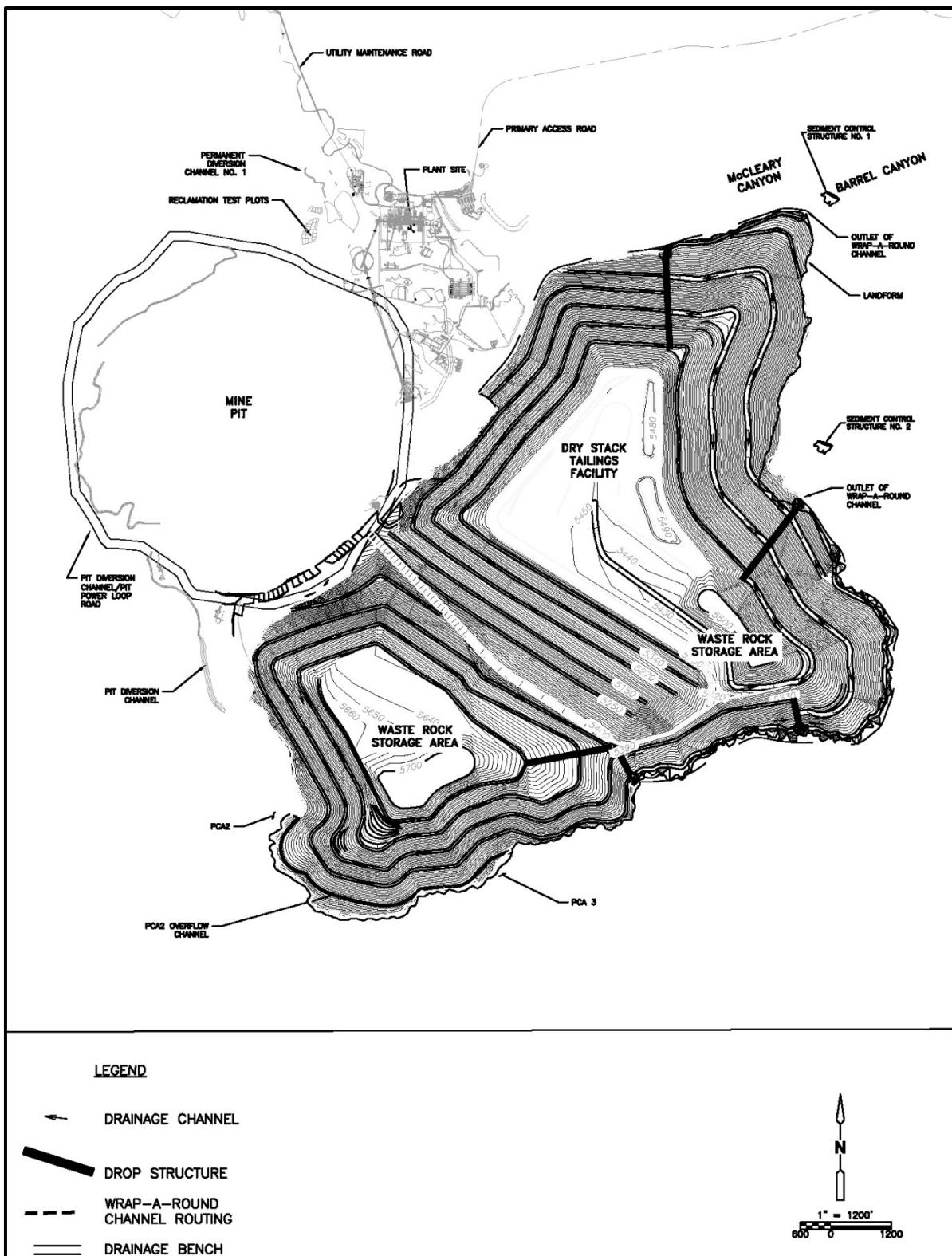


Figure 19. Barrel Alternative stormwater concept

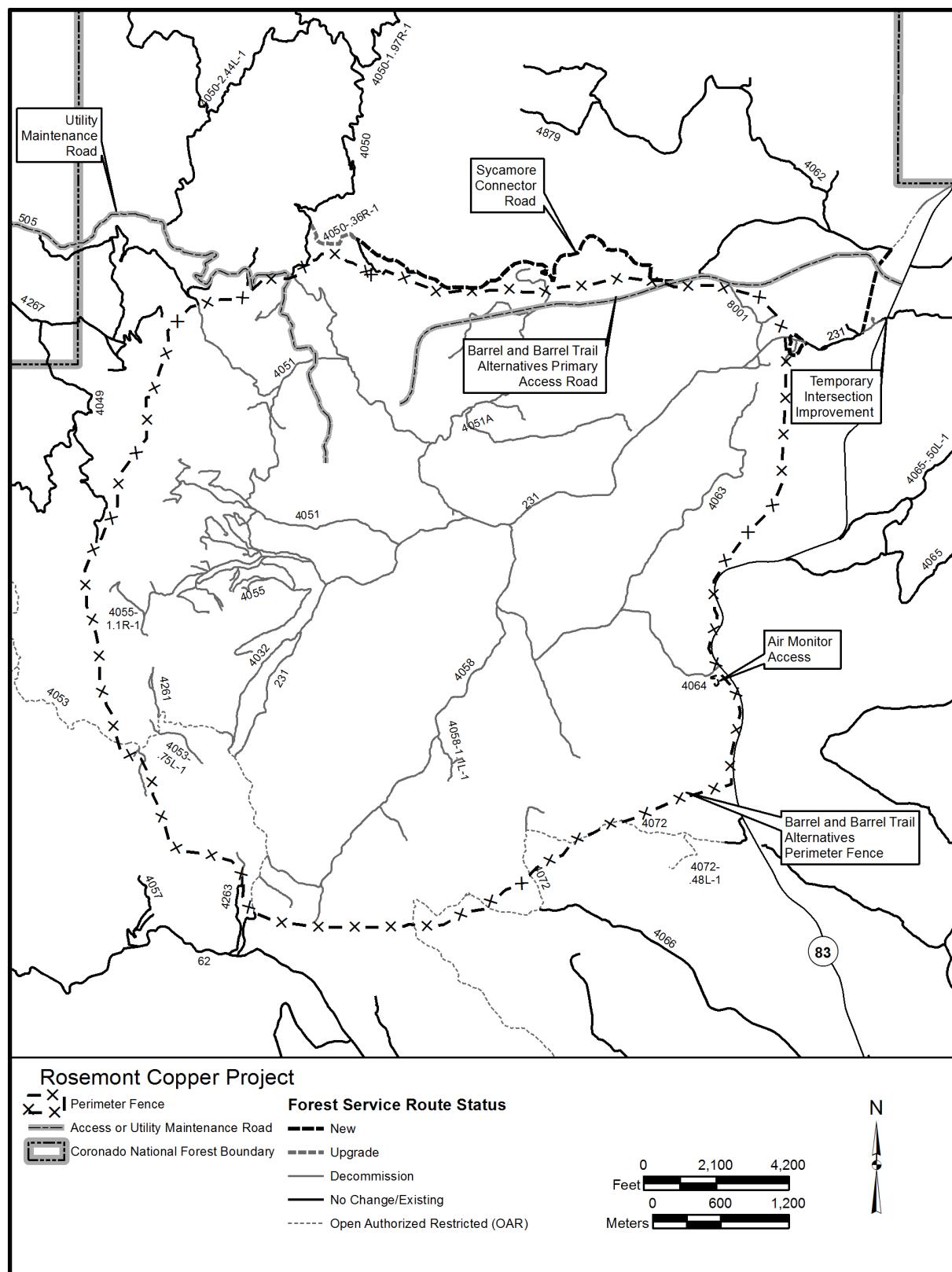


Figure 20. Road changes under the Barrel and Barrel Trail Alternatives

Alternative 5 – Barrel Trail Alternative in Detail

Specific Elements of the Barrel Trail Alternative

The Barrel Trail Alternative (figure 21) was developed to respond to significant issues regarding potential impacts on visual resources and the surface water component of water resources. This alternative was created to incorporate gentler and more varied slopes (Golder Associates Inc. 2010; Schor 2010).

Mine Life and Alternative Production Schedule

The mine life and production schedule for this alternative would be similar to that of the Phased Tailings Alternative. Refer to the description under that alternative for details.

Waste Rock and Tailings Facilities

The Barrel Trail Alternative would place all tailings and waste rock in upper Barrel, Trail, and Wasp Canyons. This alternative is similar to the Barrel Alternative in that it would permanently avoid placing mine waste in McCleary Canyon to reduce effects on surface water flows to Barrel Canyon. However, a more varied topography is proposed to more closely replicate a natural landform than the other action alternatives. However, this alternative would expand the footprint of the tailings and waste rock facilities. The topography of the Barrel Trail Alternative includes two ridges with varying elevations and an intervening valley that drains to Barrel Canyon.

Like the Phased Tailings Alternative, the Barrel Trail Alternative would incorporate a waste rock perimeter buttress that would completely surround the dry-stack tailings. The heap leach facility would be located in the same place as for the other alternatives.

Primary Access Road

The primary access road from SR 83 would be the same as for the Phased Tailings Alternative, except that the tailings conveyor system would require modification to accommodate the relocated tailings facility.

Stormwater Controls

The general style for diversion and stormwater control structures would be similar to that of the Phased Tailings Alternative, except that the valley incorporated in the final mine waste landform would carry stormwater to Barrel Canyon instead of using the rock drop structures proposed under the Phased Tailings Alternative. However, engineering concepts available thus far indicate that rock drop structures and hardened channels would be required to manage the facility without incurring excess erosion. Figure 22 shows the layout, which incorporates diversion channels and ponding areas. The Barrel Trail Alternative would use flowthrough drains, similar to the Phased Tailings Alternative.

Phasing of Concurrent Reclamation

In order to maintain concurrent reclamation of final outer slopes, waste rock would initially be placed in berms along the outside edge of the waste rock area near SR 83 and later placed behind the berms. As with all alternatives except the Barrel Alternative, the heap leach facility would ultimately be encapsulated within the waste rock and tailings facilities.

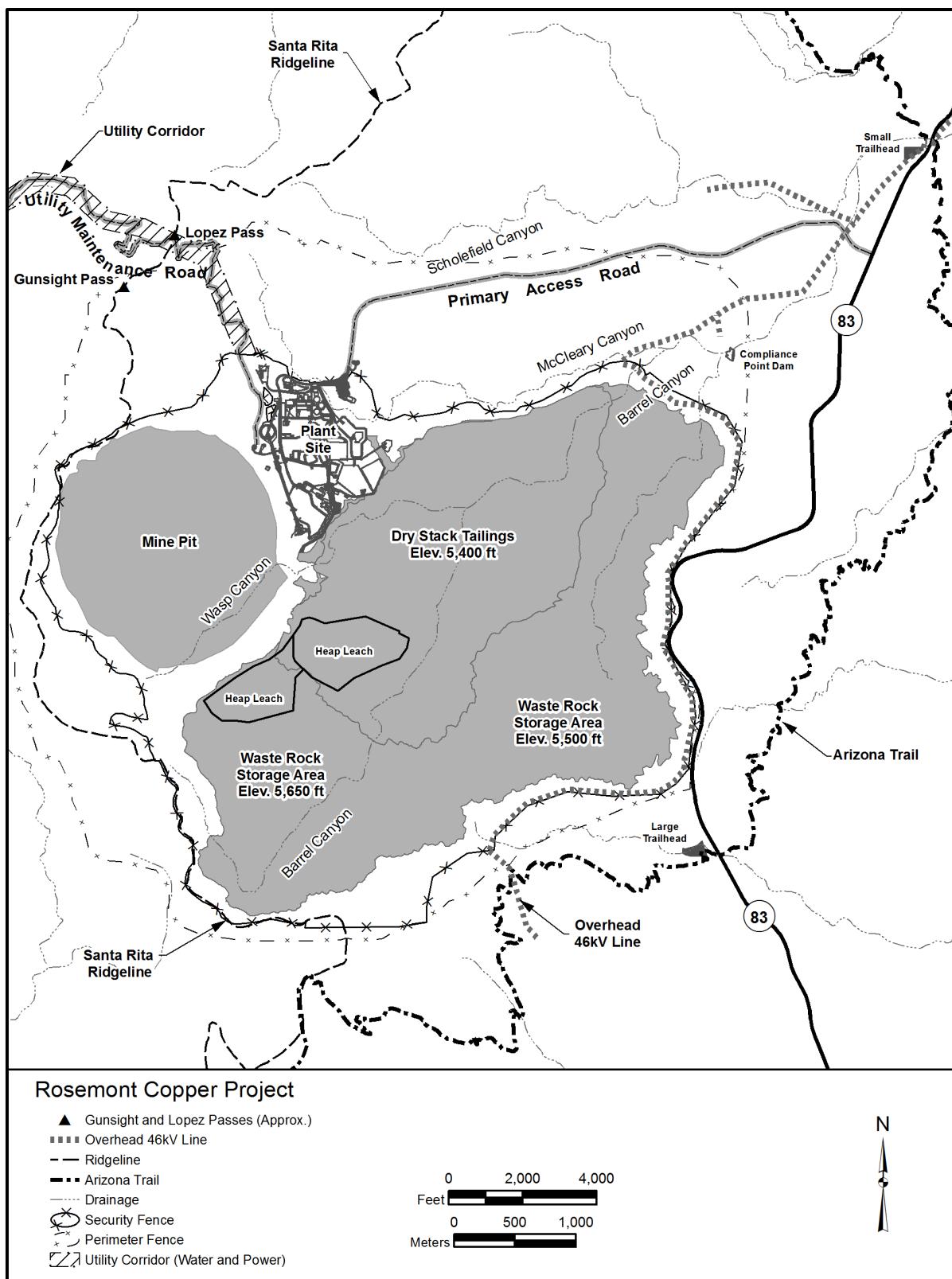


Figure 21. Alternative 5 – Barrel Trail Alternative footprint

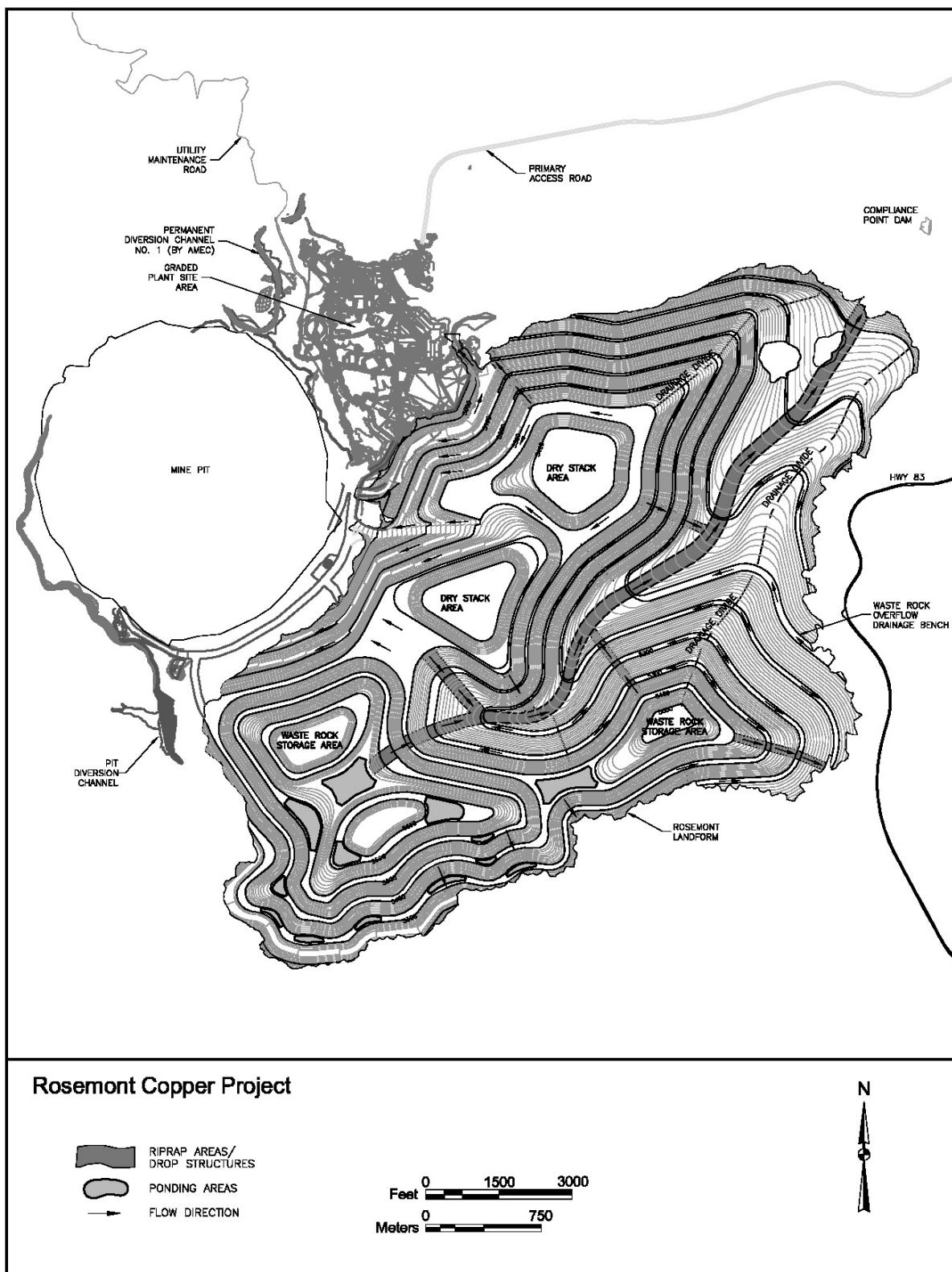


Figure 22. Barrel Trail Alternative stormwater control concept (flowthrough drains not shown)

With the Barrel Trail Alternative, concurrent reclamation could be delayed because of the need to rehandle material in order to form the final topography at closure. Without detailed plans, it is difficult to predict how the reclamation phasing would be affected by the final landform variability and the required construction aspects. It is assumed that the reclamation time frame would be similar to that of the Phased Tailings Alternative. The volume of soil that can be salvaged from the site to be used later for cover during reclamation activities is estimated at 2.9 million cubic yards.

Arizona National Scenic Trail and Area Roads

The Arizona National Scenic Trail alignment analyzed as part of this alternative is the same as for the Barrel Alternative and is located east of SR 83 (see figure 21). Area roads that are outside the perimeter fence that would either be reconnected or decommissioned are the same as for the Barrel Alternative (see figure 20). The Sycamore Connector Road is about 12,184 feet long and impacts about 26 acres. Specific information pertaining to the effects of “Alternative 5 – Barrel Trail Alternative” is summarized at the end of this chapter.

Alternative 6 – Scholefield-McCleary Alternative in Detail

Specific Elements of the Scholefield-McCleary Alternative

The Scholefield-McCleary Alternative (figure 23) was developed to respond to significant issues regarding potential impacts on cultural resources, riparian habitat resources, and the surface water component of water resources that would arise from placing the tailings and waste rock in the McCleary and/or Barrel Canyon drainages.

Mine Life and Alternative Production Schedule

The mine life and production schedule for this alternative would be similar to that of the Phased Tailings Alternative. Please refer to the description under that alternative for details.

Waste Rock and Tailings Facilities

The Scholefield-McCleary Alternative would place all tailings and the majority of waste rock north of the McCleary Canyon drainage channel. The dry-stack tailings would occupy Scholefield Canyon and an unnamed tributary drainage. Waste rock would be placed on the northern slope of McCleary Canyon above the drainage bottom and extend to the north on top of the tailings. Some waste rock would be placed in Barrel Canyon on top of and next to the heap leach facility. A series of conveyors would be required to carry the dry-stack tailings over the ridge into Scholefield Canyon. As currently expected, these conveyors would be elevated and would run through portions of McCleary Canyon east, then north around the footprint to the tailings facility (see figure 23). These conveyors would require lighting and a small one-lane maintenance road.

Primary Access Road

Because of the relocation of mine waste to Scholefield Canyon, which is the site of the primary access road for the proposed action and other action alternatives, the road would be realigned, as shown in figures 23 and 24. The primary access road would intersect SR 83 between mileposts 41 and 42 and would be 2.8 miles long.

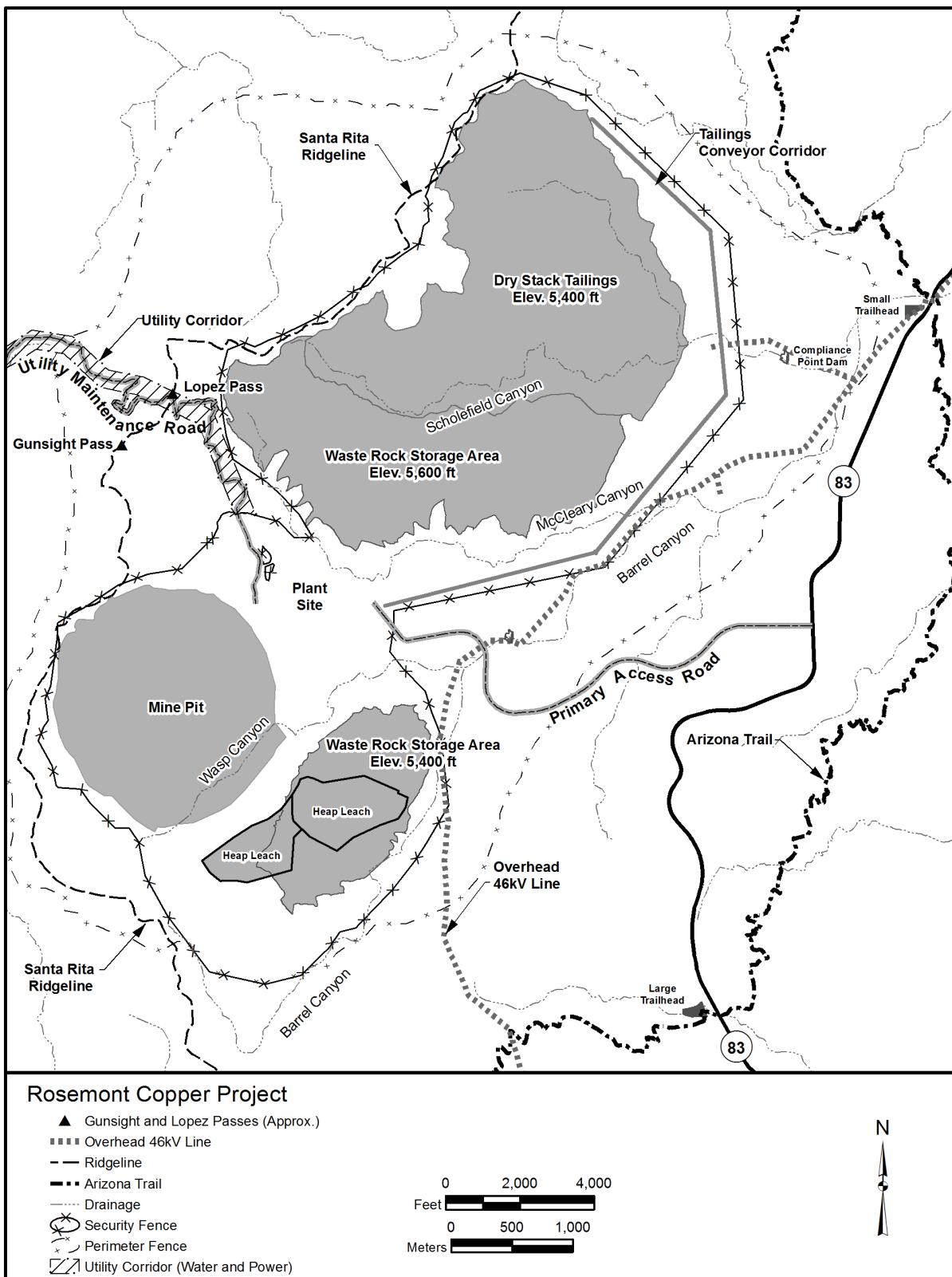


Figure 23. Alternative 6 – Scholefield-McCleary Alternative footprint

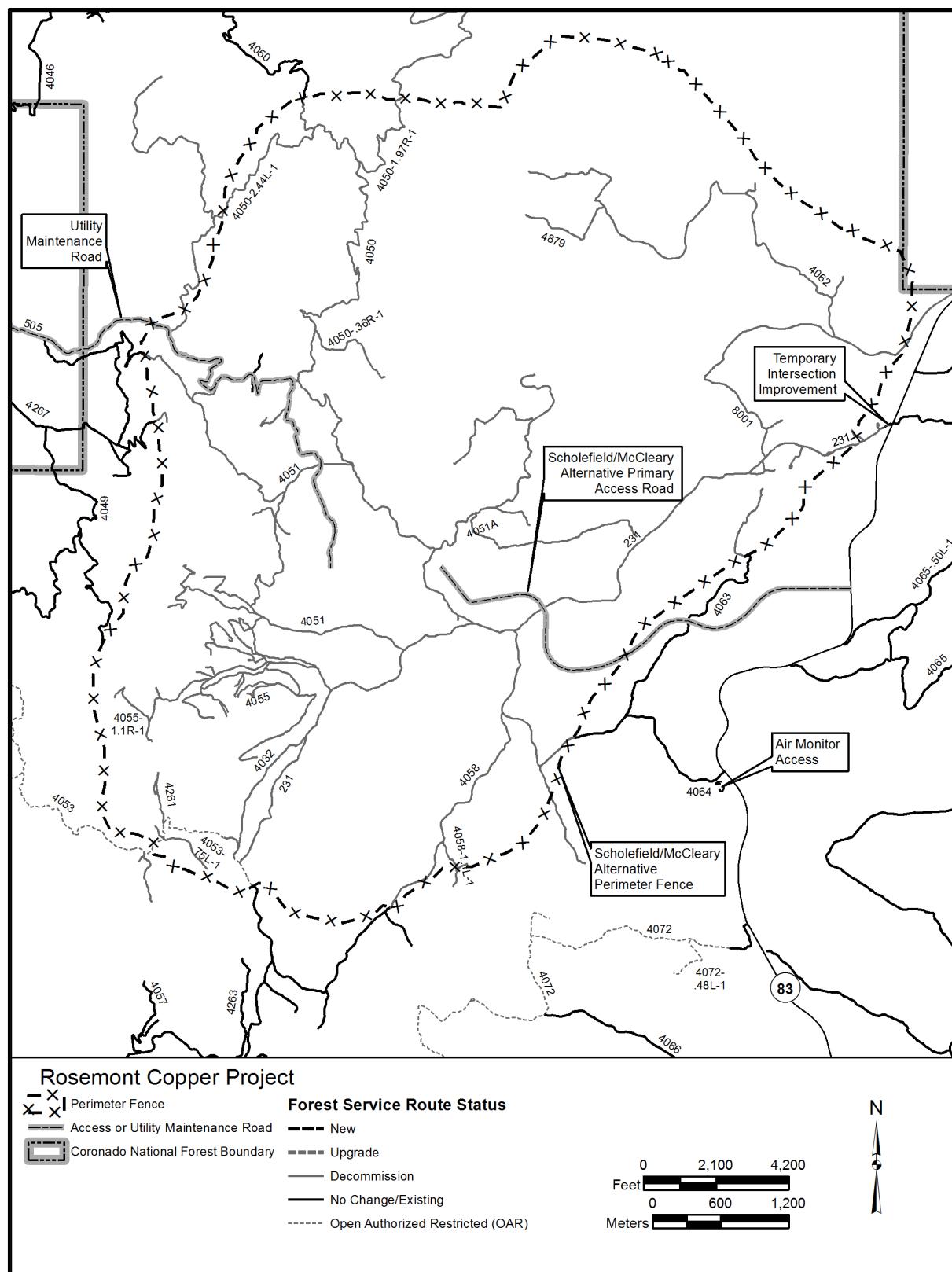


Figure 24. Road changes under the Scholefield-McCleary Alternative

Stormwater Controls

Diversion and stormwater control facilities would be designed to the same criteria used for the Phased Tailings Alternative, although there would not be any flowthrough drains. The heap leach facility and surrounding waste rock facility would use the same stormwater control design criteria as the Phased Tailings Alternative.

Phasing of Concurrent Reclamation

In order to maintain concurrent reclamation of final outer slopes, waste rock would initially be placed in berms along the outside edge of the waste rock facility near SR 83 and later placed behind the berms. The volume of soil that can be salvaged from the site to be used later for cover during reclamation activities is estimated at 712,000 cubic yards, which is substantially less than the other action alternatives. Because of the ultimate height and slope of this alternative, it is likely that reclamation efforts would require more time to implement, resulting in longer reclamation phasing. It is also likely that reclamation efforts for this alternative would focus on slope stability and structural integrity and may be delayed or altered for safety reasons during final design.

The Scholefield-McCleary Alternative is the most problematic with respect to concurrent reclamation, with constraints caused by its having greater slopes, greater safety concerns, and less soil salvage material. The conveyor system located east of the waste rock and tailings facilities would also likely be removed and the area reclaimed during final closure activities.

The heap leach facility would be located in Barrel Canyon, as it would for the proposed action, the Barrel Trail, and the Phased Tailing Alternatives. Reclamation of the heap leach pad would include encapsulating it with waste rock to a minimum thickness of 20 feet on top of the pad and constructing the side slopes of the waste rock cover, as proposed under the Phased Tailings Alternative. However, the area over and around the heap leach pad would be left open during the leaching process.

Arizona National Scenic Trail and Area Roads

The Arizona National Scenic Trail alignment analyzed as part of this alternative is the same as for the Barrel Alternative and is located east of SR 83 (see figure 23).

Area roads that are outside the perimeter fence that would either be reconnected or decommissioned are the same as for the Barrel Alternative (see figure 24). There is no Sycamore Connector Road in this alternative. Specific information pertaining to the effects of “Alternative 6 – Scholefield-McCleary Alternative” is summarized at the end of this chapter.

Mitigation and Monitoring

CEQ regulations (40 CFR 1508.20) define mitigation measures as follows:

- Avoiding an impact by not taking a certain action or parts of an action;
- Minimizing an impact by limiting the degree or magnitude of the action and its implementation;
- Rectifying an impact by repairing, rehabilitating, or restoring the affected environment;
- Reducing or eliminating an impact over time, through preservation and maintenance operations during the life of the action; and
- Compensating for an impact by replacing or providing substitute resources or environments.

Mitigation measures are integral components of the design of the proposed action presented earlier in this chapter, as well as being integral to the development of alternatives to the proposed action. Additional measures designed to mitigate or compensate for impacts have been identified from a variety of sources, including the ID team, cooperating agencies, Rosemont Copper, and public comments.

The role of the Coronado under its primary authorities in the Organic Administration Act, Locatable Regulations (36 CFR 228 Subpart A), and Multiple-Use Mining Act is to ensure that mining activities minimize adverse environmental effects on NFS surface resources. The Coronado may impose reasonable conditions to protect surface resources but cannot materially interfere with reasonably necessary activities under the General Mining Law that are otherwise lawful. The Forest Service authority related to mitigation is limited to protection of surface resources of NFS lands (see 30 U.S.C. 612, 5 U.S.C. 551, and 36 CFR Part 228.1). In order for the Forest Service to require implementation of mitigation, the mitigation must have a direct connection to avoiding, mitigating, or minimizing effects on NFS surface resources. The Forest Service has no authority, obligation, or expertise to determine or enforce compliance with other agencies' laws or regulations. The Forest Service seeks to coordinate with other agencies to approve a legally compliant final MPO. However, it is the operator's responsibility to ensure that its actions comply with applicable laws.

The Coronado has developed a mitigation and monitoring plan that meets the guidance and direction specified by the CEQ and applicable laws and regulations (see appendix B of this FEIS). It is important to note that this NEPA analysis and documentation is being prepared prior to final design of the project and before a final MPO is prepared. The full suite of mitigation and monitoring requirements will not be known until all required permits have been issued, as they contain measures required by resource agencies to avoid, reduce, and monitor environmental effects.

Many mitigation measures have been refined or added since the release of the DEIS. In order to improve readability, the table of specific mitigation and monitoring items has been moved into appendix B. Details about the mitigation measures, including their effectiveness in avoiding, reducing, or compensating for potential impacts, are further described in the resource sections in chapter 3.

Guidance provided to Federal agencies by the CEQ states that agencies should not commit to mitigation measures absent the authority or expectation of resources to ensure the mitigation is performed (Council on Environmental Quality 2011). All suggested mitigation measures were screened by the ID team and recommended measures reviewed by the responsible official.

Part of that review involved determining whether the Forest Service has the authority to require certain mitigation; whether the proposed mitigation would effectively avoid, reduce, eliminate, or compensate for predicted effects; and whether the Forest Service or another regulatory permitting agency has the authority to ensure that the mitigation will be implemented.

While much of mitigation measures described in appendix B of this FEIS would be required, Rosemont Copper has proposed to implement a number of mitigation measures that are beyond the scope of authority of the Forest Service or other regulatory permitting agencies.

The listing and description of mitigation measures and monitoring in appendix B indicates which are mandated by either the Forest Service or other regulatory agencies and which are being proposed by Rosemont Copper. It is important to note that mitigation measures that are proposed by Rosemont Copper are addressed separately from required mitigation that is within the authority of the Forest

Service, or from other regulatory and permitting agencies, with the understanding that measures proposed by Rosemont Copper may or may not be implemented. Mitigation measures that have been proposed but not developed with enough detail to determine their effectiveness in mitigating impacts are listed as potential future mitigation, but their effectiveness has not been addressed in the impact analyses in chapter 3.

Monitoring is necessary in some cases to demonstrate compliance with permit requirements and in others to measure the success of mitigation. Monitoring is fundamental in ensuring the implementation and effectiveness of mitigation commitments, meeting legal and permitting requirements, and identifying trends and possible means for improvement (Council on Environmental Quality 2011). CEQ regulations explicitly require that “a monitoring and enforcement program shall be adopted . . . where applicable for any mitigation” (40 CFR 1505.2(c)).

Monitoring and evaluation apply at both the forest plan and project-specific levels. The National Forest Management Act requires that national forests monitor and evaluate their forest plans (36 CFR 219.11) and addresses monitoring requirements contained in site-specific decisions. Chapter 6 of the “Coronado National Forest Land and Resource Management Plan” (U.S. Forest Service 1986) addresses monitoring and evaluation activities that are part of forest plan implementation.

Title 36 CFR 219.11(b) states:

Monitoring of site-specific actions. The decision document authorizing a site-specific action should describe any required monitoring and evaluation for the site-specific action. The responsible official must determine that there is a reasonable expectation that anticipated funding is adequate to complete any required monitoring and evaluation prior to authorizing a site-specific action.

The CEQ (Council on Environmental Quality 2011) states:

Once an agency determines that it would provide for monitoring in a particular case, monitoring plans and programs should be described or incorporated by reference in the agency’s decision documents. The mitigation plan and program should be described to the extent possible based on available and reasonably foreseeable information in cases where NEPA analysis and documentation are completed prior to final design of a proposed project.

Mitigation and Monitoring – Reporting and Evaluation

Rosemont Copper would fund the monitoring to which the Forest Service commits in the ROD and that is defined in the final MPO. Other monitoring activities may be associated with the regulatory authority of Federal and State agencies and would be funded by permit fees or the agencies themselves as part of their normal activities. Title 36 CFR 219.11(d) states:

Use of monitoring information. Where monitoring and evaluation is required by the plan monitoring strategy, the responsible official must ensure that monitoring information is used to determine one or more of the following:

1. If site-specific actions are completed as specified in applicable decision documents;
2. If the aggregated outcomes and effects of completed and ongoing actions are achieving or contributing to the desired conditions;
3. If key assumptions identified for monitoring in plan decisions remain valid; and/or

4. If plan or site-specific decisions need to be modified.

Monitoring and evaluation activities would be prescribed, conducted, and/or reviewed by Rosemont Copper, the Coronado, and other regulatory agencies participating in a proposed multiagency monitoring and evaluation task group. The Coronado Forest Supervisor plans to invite county, State, and Federal agencies with permitting or other regulatory authority, to participate on this task group. The task group would meet at least annually to review and evaluate monitoring results and make recommendations to the Forest Supervisor. Evaluation would indicate: (1) whether monitoring requirements have been completed according to the final monitoring plan; (2) whether monitoring results indicate that the effects and results of mining and related activities are within the range of those predicted in the FEIS and ROD; (3) whether monitoring activities and methods remain valid and whether continued monitoring is warranted going forward; and (4) whether changed conditions, if any, dictate modification of the final MPO and/or ROD.

As needed, the task group would further define and recommend thresholds for determining compliance with the NEPA decision, as well as applicable mitigation measures and permit requirements. The authorized agency for that decision or permit would make a final determination regarding all recommendations by the task group, including thresholds and compliance. For instance, determination of compliance with the Forest Service NEPA decision would be made solely by the Coronado Forest Supervisor. Determination of compliance with requirements of the aquifer protection permit would be made by ADEQ. The task group would also be used as a forum to identify, develop, and recommend actions that could be taken should monitoring indicate that impacts are outside the bounds specified in the NEPA decision or applicable permit or authorization. Final determination of contingency actions would remain with the authorized agency.

Permits and authorizations such as the aquifer protection permit, air quality permit, biological opinion, and CWA section 404 permit contain details on monitoring, reporting, and evaluation that are specific to that permit or authorization. Once the ROD is approved and applicable permits and authorizations issued, a comprehensive monitoring, reporting, and evaluation plan would be compiled that specifies the various reporting requirements.

Rosemont Copper would be required to compile monitoring results into a monitoring report that would be provided to the Forest Service on a quarterly basis. Any monitoring result that is not in compliance with the effectiveness criteria would be reported to the Forest Service within 72 hours. After reviewing the results of these reporting requirements, the Forest Service would notify members of the multiagency monitoring group should conditions warrant interim or emergency meetings.

In addition to quarterly monitoring reports, Rosemont Copper would submit an annual report to the Coronado and the multiagency monitoring task group that contains a description of all activities conducted during the previous year and a summary of applicable information as approved by the Forest Service, along with annual results of all monitoring plans in a format approved by the Forest Service, including a complete data summary and any data trends, a mining status plan, and plans for the coming year. Significant changes would be required to be incorporated into the final MPO and reflected in financial assurance. Past, ongoing, or projected impacts on the environment may also require amendment of the final MPO, ROD, and/or financial assurance held for the project. Note that the biological opinion contains requirements for reporting and evaluation of monitoring results associated with species listed as threatened or endangered under the Endangered Species Act. Refer to the biological opinion in appendix F for details.

Rosemont Copper has agreed to enter into a voluntary collection agreement with the Coronado to fund work performed by Coronado employees, consultants, and/or cooperators assigned to administer and monitor the project. This would include a minerals administrator; a biological monitor, whose role in overseeing monitoring activities is described in the biological opinion (see appendix F); and the time spent by the forest archaeologist to oversee the implementation of the historic properties treatment plan for the construction, operation, and reclamation of the project. Details regarding other Coronado positions that would be necessary for administering the project and overseeing monitoring are still being developed.

Postclosure Monitoring

While the Rosemont Copper Project has been designed with the intent of minimizing long-term maintenance and monitoring, it is recognized that the potential exists for continued monitoring of postmine conditions beyond the final reclamation and closure phase, as described above. To that end, all reclaimed sites would be monitored a minimum of twice a year for a period to be determined, in order to evaluate the success of reclamation work. Any areas not meeting reclamation goals would be analyzed to determine the underlying problems, which would be addressed with a modified plan.

In addition, groundwater would be monitored for a specific period of time to be decided by ADEQ closure requirements. Surface water would be monitored as required in the Arizona Pollutant Discharge Elimination System program following cessation of mining operations. Final monitoring details and locations would be decided when the ADEQ provides the Arizona Pollutant Discharge Elimination System permit. Results of this monitoring would be used to evaluate the success of the measures taken to protect the water resources. Any changes in water quality would be evaluated to determine whether the changes are related to the reclaimed mining features, and appropriate steps would be taken to address the problem. Financial assurance would be adjusted to the extent allowed by law and regulation related to these ongoing activities.

Financial Assurance

A number of public and agency comments requested that detailed information regarding financial assurance and/or calculations of the financial assurance that would be required for this project be disclosed in the FEIS. In response to these comments, further explanation of the Forest Service's regulations and policy is provided below in figure 25 in an attempt to illustrate the standard process followed by the Forest Service.

As part of the approval of the final MPO for the Rosemont Copper Project, the Forest Service would require Rosemont Copper to post a financial assurance amount that would provide adequate funding to allow the Forest Service to complete reclamation and postclosure operations, maintenance activities, and necessary monitoring for as long as required to return the site to a stable and acceptable condition. The financial assurance amount would be determined by the Forest Service and would "address all Forest Service costs that would be incurred in taking over operations because of operator default" (U.S. Forest Service 2004a).

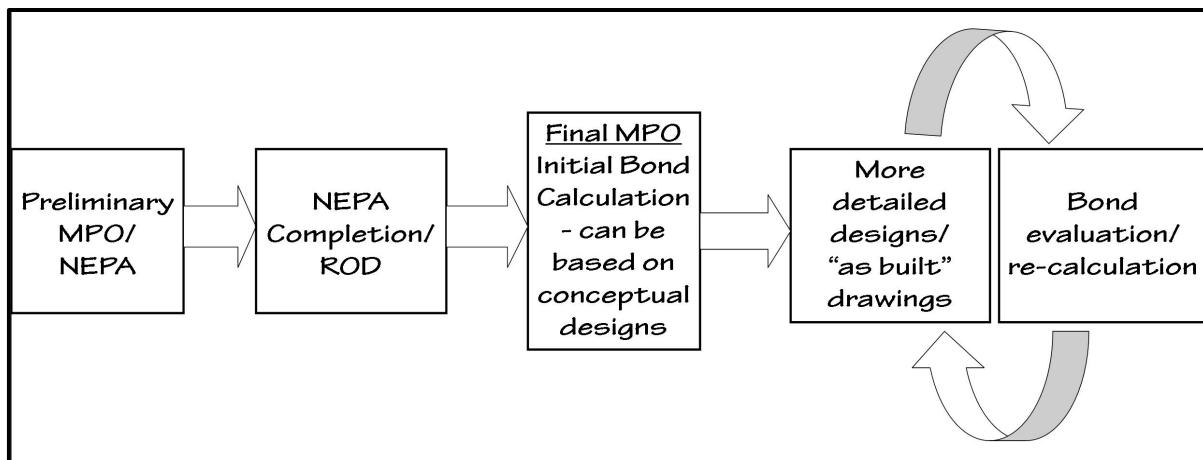


Figure 25. Basic Forest Service bonding process as supported by regulations and guidance

The financial assurance would be required in a readily available bond instrument payable to the Forest Service. In order to ensure that the bond can be adjusted as needed to reflect actual costs and inflation, there would be provisions allowing for periodic adjustment on bonds in the final MPO prior to approval. Selection of the bond period may be based on some logical stage of mine development, such as construction, certain facilities' implementation, and/or closure (U.S. Forest Service 2004a). Initial bond estimates are typically based on the engineering plans for construction, and it is likely that the initial bond for this project would be calculated to cover the construction period, with the first periodic review planned for 1 year after construction begins. The Forest Service process does not require calculation of the bond prior to publication of the FEIS or completion of the NEPA process.

The reclamation bond amount is an estimate of both direct and indirect costs to reclaim the operation, based on the costs to perform the work. This estimate is also to consider the time of operation in which reclamation costs would peak. This cost peak can be determined by looking subjectively at the mine schedule and timing of the greatest areas and volumes of disturbance and materials or by quantitatively calculating reclamation costs on an annual basis. As reclamation plans evolve from conceptual designs during permitting to as-built designs during construction, the bond estimates and requirements “may trigger recalculation of the estimate and a bond adjustment” (U.S. Forest Service 2004a:50). Further, “reclamation standards and bond estimates (with accompanying details) become legally binding when the operator changes the proposed Plan of Operation to include them, posts the required bond, and is notified by the authorized officer that the Plan of Operation is approved” (U.S. Forest Service 2004a).

The Forest Service requires that all bonds pertaining to mining operations on NFS lands be developed or reviewed by a Certified Locatable Minerals Administrator. The training abilities and required knowledge of the administrator are outlined in FSM 2800, chapter 2890 (U.S. Forest Service 2007f). If an increase in the bond is required, the Forest Service will not approve the operating plan modification until Rosemont Copper submits the additional bond amount. Forest Service regulations at 36 CFR 228.13 require submittal of a bond for reclaiming disturbances on NFS lands before approval of an MPO. The agencies may conduct additional comprehensive bond reviews if, after modification of a reclamation or operating plan, an annual overview, or an inspection of the permit area, an agency determines that an increase in the bond level may be necessary. Bond release is

performance based and is granted or denied based on the agencies' evaluation. The Forest Service may not release a bond until the reclamation requirements of 36 CFR 228.8(g) are met.

Because this project is on both private and Federal lands that include WUS, the Forest Service, USACE, and Arizona State Mine Inspector have financial assurance and/or bonding requirements. USACE can "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." Depending on how USACE required compensatory mitigation is fulfilled, "the district engineer may determine that financial assurances are not necessary for that compensatory mitigation project." This could happen when the compensatory mitigation is carried forward under separate contracts or agreements that hold the proponent responsible for funding the particular mitigation program, such as an "in-lieu fee program." If financial assurances are required by USACE directly, "the amount of the required financial assurances must be determined by the district engineer, in consultation with the project sponsor, and must be based on the size and complexity of the compensatory mitigation project, the degree of completion of the project at the time of project approval, the likelihood of success, the past performance of the project sponsor, and any other factors the district engineer deems appropriate." Also, when determining the amount, USACE would "consider the cost of providing replacement mitigation, including costs for land acquisition, planning and engineering, legal fees, mobilization, construction, and monitoring" (33 CFR 332.3).

The Arizona State Mine Inspector has expressed a willingness to work cooperatively with the Coronado to bond for the project, covering the private lands as well. This is encouraged in FMS 2817.24: "All reasonable effort should be made, through agreements with States which require bonds for reclamation disturbances in National Forests, to avoid double bonding" (U.S. Forest Service 2007b). This coordination is also encouraged in the Arizona State Mine Inspector's Mined Land Reclamation Statutes, ARS 27-932, by stipulating that the state mine inspector "shall coordinate the review and approval of reclamation plans" with agencies that manage public lands. The Arizona State Mine Inspector's Mined Land Reclamation Statutes, ARS 27-903b, also state that the "Inspector shall avoid redundant, inconsistent or contradictory reclamation, inspection, administration, enforcement and financial assurance requirements." Coordination between the various agencies requiring bonding will occur at a later date to determine which elements of the bonds will be managed by the agencies.

ADEQ requires a permit and bonding as part of the aquifer protection permit for closure and groundwater protection. Rosemont Copper has submitted calculations in section 13 of their aquifer protection permit application that include all reclamation costs, including bonds for the Forest Service, Arizona State Mine Inspector, and ADEQ. These calculations have not yet been reviewed by the Forest Service. Since the information that is necessary to calculate the bond is not fully known at this time, it is premature for the Forest Service to calculate bond amounts.

Once a final NEPA decision has been determined and adequate detailed information has become available, the Forest Service would calculate bond amounts and ensure that adequate bonding is provided. It is not unusual for additional standards to be developed as part of the bond estimation process. This takes place after NEPA documents are issued but before the final MPO is approved. These additional standards typically address the "how to" of reclamation work and would not have the effect of creating new reclamation requirements that would result in different environmental impacts from those disclosed through the NEPA process (U.S. Forest Service 2004a:12).

It should be noted that the EPA is proposing the development of financial responsibility requirements for the hardrock mining industry (Federal Register 74:37213, "Identification of Priority Classes of

Facilities for Development of CERCLA Section 108(b) Financial Responsibility Requirements"). The rule, if promulgated, would require the hardrock mining industry to post financial responsibility for remediation costs of hazardous substance releases from their mine sites.

Alternatives Considered but Eliminated from Detailed Study

NEPA, the CWA, Organic Administration Act, and Forest Service regulations (36 CFR 228) governing mineral development on NFS lands provide guidance regarding alternatives development. Reasonable alternatives include those "that are practical or feasible from technical and economic standpoints and using common sense, rather than simply desirable from the standpoint of the applicant" (Council on Environmental Quality 2007:16). The selection of alternatives under CEQ criteria includes consideration of a reasonable range of alternatives that meet the project purpose and need and are economically and technically feasible.

An analysis of alternatives is also required by the USACE and the EPA to demonstrate compliance with guidelines established under Section 404(b)(1) of the CWA (40 CFR 230) for avoidance and minimization of impacts to jurisdictional WUS. The alternatives analysis is intended to ensure that no discharge be permitted "if there is a practicable alternative to the proposed discharge which would have less adverse impact on the aquatic ecosystem, so long as the alternative does not have other significant adverse environmental consequences" (40 CFR 230.10(a)). See appendix A of this FEIS for further information on the Section 404(b)(1) alternatives analysis.

Several alternatives to the proposed action that were suggested during the scoping period, in public comments about the DEIS, or by other sources. An iterative review by the Coronado ID team, the Coronado's consultants, cooperating agencies, and Rosemont Copper screened the suggestions to determine whether any presented reasonable alternatives to the proposed action, as defined by the CEQ. Rosemont Copper participated in the process in accordance with the terms of a memorandum of understanding that defines the working relationships among the Coronado, Rosemont Copper, and the third-party NEPA consultant (U.S. Forest Service 2009a). Rosemont Copper's role was limited to providing technical expertise regarding contemporary mining practices and overall construction feasibility. All of Rosemont Copper's input was reviewed by the Coronado and its consultants.

The following criteria were evaluated:

1. Does the alternative meet the project purpose of and need for action (see chapter 1)?
2. Does the alternative resolve environmental or resource conflicts, from which issues were identified (see chapter 1)?
3. Is the alternative available?
4. Is the alternative feasible in terms of cost, current technology, and logistical capability?

Considering these criteria, the responsible official determined which alternatives would be evaluated in the EIS and which would be eliminated from detailed consideration. A summary of alternatives considered but eliminated from detailed study follows. The descriptions capture the general rationale for eliminating from detailed study general groups of alternative themes that were raised during scoping, in comments on the DEIS, or by the ID team. See "Alternatives Considered but Eliminated from Detailed Study" (U.S. Forest Service 2011a) for further information.

Mining Other Locations

Alternative mining locations, the purchase of a different copper mine, or the reopening of closed copper mine were considered.

Rosemont Copper owns private mineral rights and has a possessory interest for mining purposes in unpatented mining claims on the land where the project is proposed. Therefore, the company has a legal right to access minerals associated with their claims. Furthermore, the Forest Service is required to consider all proposals that meet the requirements under 36 CFR 228 Subpart A. Forest Service regulation and policy is to allow reasonably incidental mineral operations on claims in a manner that minimizes adverse environmental impacts on NFS surface resources by imposing reasonable conditions that do not materially interfere with mineral operations (36 CFR Part 228 Subpart A and FSM 2800). Mining at other locations would not meet the statutory and regulatory criteria or FSM direction.

Additionally, one of the criteria in determining practicable alternatives is whether a site is “available.” “Available” means that the site could be reasonably obtained, used, expanded, or managed by Rosemont Copper in order to fulfill the basic project purpose (40 CFR 230.10(a)(2)). The USACE dismissed some alternative sites that were unavailable. See appendix A, “U.S. Army Corps of Engineers’ Section 404(b)(1) Alternatives Analysis,” of this FEIS for further details on the analysis.

Eleven sites in southern Arizona were considered in the 404(b)(1) alternatives analysis. Of the 11, 7 sites were not available for sale in 2005 when Augusta Resource Corporation (Augusta Resource) purchased the Rosemont property; two were in the early phase of exploration, with mineral reserves yet to be proven, and were therefore unavailable; one was not identified until 2007 and was therefore unavailable; and one was beyond the financial capitalization capability of Augusta Resource.

Mining Methods

Alternative mining methods that were considered are discussed below. The preliminary MPO calls for extraction of the ore from a cone-shaped pit. This would accommodate the optimum removal of the ore body for processing. Rosemont Copper has a legal right to access minerals associated with their claims, and the Forest Service is required to consider all proposals that meet the requirements under 36 CFR 228 Subpart A. Refer to the “Purpose of and Need for Action” section in chapter 1 of this FEIS for further information regarding statutes, regulations, and policies that govern mining on NFS lands.

Shafts, Adits, and Other Underground Methods

The Rosemont ore deposit is disseminated across a wide area underground, unlike minerals deposited in veins or other concentrations. Mining using shafts, adits, and related underground workings would not allow access to the full ore body. Furthermore, the ore is not of sufficient concentration to make it economically feasible to recover using this approach.

Reducing Pit Size

The pit configuration proposed by Rosemont Copper was reviewed by the Coronado and its consultants. The proposed pit was deemed appropriately configured, in terms of size, to access the ore body. A reduced pit size would limit Rosemont Copper’s ability to fully access all of the minerals to which they own or claim mineral rights. Forest Service regulation and policy is to allow reasonably

incidental mineral operations on claims in a manner that minimizes adverse environmental impacts on NFS surface resources by imposing reasonable conditions that do not materially interfere with mineral operations (36 CFR Part 228 Subpart A). In accordance with direction in FSM 2830.1, the Forest Service generally does not have authority to deny the exercise of a mineral reservation or outstanding mineral right. There is additional information provided in appendix A, “U.S. Army Corps of Engineers’ Section 404(b)(1) Alternatives Analysis.”

In Situ Leaching

“In situ” is Latin for “in place” and refers to the recovery of the metals without any significant disturbance of the rock matrix. Leach solutions, generally a weak sulfuric acid solution, are pumped into the ground via an injection well and subsequently travel through the fractures in the rock and dissolve the minerals. Recovery wells are installed to recover the metal bearing solutions. There are a number of Arizona mining operations using in situ copper mining, and pilot testing has occurred at several locations.

In situ leaching works well in heavily fractured rock in which copper oxide and soluble copper sulfides are deposited along fractures, there is a very short distance (on the scale of inches) to the nearest fracture, the oxide zone represents a significant proportion of the deposit, and the leach solutions can evenly penetrate the mass of the rock to dissolve the contained copper. Environmental control is best maintained where there are no abrupt changes in the elevation of the ore deposit (e.g., across fault blocks) and where there is an overlying confining unit to protect and separate the local and regional aquifers. These physical conditions are lacking at the Rosemont deposit. Use of the in situ leaching method at the Rosemont Copper Mine would result in the loss of salable copper, silver, and molybdenum from the sulfide ores. Copper recovery from the oxide ore would be low, and it would be difficult to control inadvertent migration of leach solutions into the permeable basin-fill formations and from there into the aquifer.

The solubility of the minerals themselves is a major consideration. It is not technically possible for the sulfide mineralization proposed for mining by Rosemont Copper to be leached effectively using in situ leach methods because of low permeability in the sulfide zone and the inability of the leach solutions to contact the sulfide mineralization.

The Rosemont oxide ore may have sufficient solubility in the presence of leaching solutions for in situ leaching methods to be considered. This mineralized rock, however, is an acid-consuming ore and of very low grade, at 0.17 to 0.18 percent total copper (Huss 2009:81; WestLand Resources Inc. 2007a), and would provide insufficient copper recovery values. If attempted, in situ leaching would be applied to an ore of substantially lower grade than other copper ores leached “in place” in Arizona. “In place” grades at the Florence, Tohono, or Miami copper deposits are in the 0.3 percent or greater total copper concentration range.

In addition, leach solutions can migrate vertically or laterally away from the basin-fill bounded fault blocks into the conglomerate, which increases the likelihood of groundwater contamination. Furthermore, the rock matrix is acid consuming and may self-seal due to the formation of gypsum (calcium sulfate). From the description of regional geology (WLR Consulting Inc. 2007:19), it appears that the solution flow would be impacted by faults and cracks (redirecting the solution to barren rock, for example), thereby reducing the ability of the leach solution to dissolve the copper silicates.

Sulfide mineralization cannot be recovered using in situ methods. The copper oxide mineralization may be recoverable by in situ methods. However, the oxide zone is only 10 percent of the identified copper resource based on the stated reserves, and a portion of the oxide zone may be above the water table. In addition, molybdenum and silver are essentially nonsoluble in weak sulfuric acid solutions and cannot be recovered using these techniques. For these reasons, these techniques were eliminated from detailed study.

High-Temperature/High-Pressure Leaching

The use of high-temperature/high-pressure leaching was recommended for onsite processing of oxide and sulfide ores. Leaching would be followed by solubilization using a weak sulfuric acid solution and treatment of the copper-bearing solutions by solvent extraction and electrowinning methods. The recovered copper would be in the form of copper cathode as the final site product.

The oxide ores in the Rosemont deposit are already oxidized, and any treatment by oxidation (high temperatures) and pressure is unnecessary. The sulfide ore, however, is materially different in mineralization. The ore would have to be reduced to a size at which the surfaces could be oxidized and the treated ores leached. Crushing and milling, as required to make concentrates as proposed in the preliminary MPO, would be required. However, the physical size of the ore particles would have to be reduced to a dramatically smaller size than that required for production of concentrate. There is no record of bulk or milled copper ore being treated by high-temperature/high-pressure leaching. Furthermore, there is no process in this alternative that would allow for the recovery of silver and molybdenum.

Traditional Slurry Tailings

The preliminary MPO proposes that the tailings be filtered to achieve an overall water recycle rate that exceeds 90 percent (dry-stack tailings). The filtered tailings would then be mechanically conveyed to the tailings facility for final disposition of the material. Although this technology is in use in other mines in Alaska and South America, it has not been applied to any of the large mines in Arizona. Public concerns about the use of mechanical filters for removal of the water from tailings were expressed. A regionally proven alternative would be to employ the use of slurry tailings.

This alternative was deemed to have greater overall impacts and greater environmental risks than the dry-stack tailings method. A previous study (Arnold and Meyer 2006) determined that a dry-stack tailings facility was preferred when environmental, socioeconomic, project economics, and technical parameters were evaluated. Compared with traditional slurry tailings, dry-stack tailings would do the following:

- Eliminate the need for an engineered embankment and seepage containment system;
- Increase water conservation;
- Reduce the footprint and associated impact to resources; and
- Allow concurrent reclamation and covering for dust control.

Transporting Tailings by Slurry Pipeline to Scholefield Canyon

Transporting the tailings to Scholefield Canyon using a slurry pipeline was considered. With this option, the tailings would be transported to a separate tailings filter plant and dewatered prior to their placement in Scholefield Canyon via an additional conveyor. This option would require additional

disturbance for a remote filter plant, as well as at least one drain pond in the event of a pipeline failure. Therefore, this option was eliminated from further study.

Configuring the Pit to Allow “Continuous” Backfill

The geometry of the ore body is such that a conical pit would require the smallest amount of excavation to maximize the extraction of the ore. Other types of ore bodies and coal seams lend themselves to being extracted in a linear fashion such that the overburden can be used to backfill the pit as extraction advances. Extracting the ore from the proposed Rosemont Copper Mine using continuous backfill would require a substantially larger pit. A larger pit would result in greater impacts while reducing the economic feasibility of the project.

Complete Backfill or Partial Backfill of the Pit

During development of the DEIS, several scenarios were evaluated in which the waste rock and tailings would be placed back in the pit after mining. These scenarios included changing the footprint of the facilities to reduce impacts and placing the waste rock and tailings near the pit and away from sensitive resources. The responsible official subsequently determined that complete pit backfill would not be considered in detail. At the time of publication of the DEIS, the Forest Service was investigating the option of partial pit backfill as a potential mitigation measure for inclusion in the FEIS.

In response to public and agency comment on the DEIS, the responsible official instructed the ID team to further investigate the feasibility of both complete and partial pit backfill for possible inclusion in the FEIS. The results of that investigation are presented below. Two methods of backfill were investigated for each option: (1) downhill haulage into the pit with loaded trucks; and (2) dumping over the pit rim. Both methods have safety concerns.

Downhill haulage with heavily loaded, large-tonnage haul trucks is generally avoided within open-pit operations whenever possible, especially when hauling down ramp roads with sharp switchback turns. If this type of haulage is performed, it is typically only for short-duration repair or construction activities and along short-distance road lengths, rather than for extensive periods of time over long distances at fairly steep grades. Safety pullouts, ramps, and redesign of the switchback turns are not achievable on a final pit configuration because there is no room in which to do this. Design for postclosure downhill haulage would need to be incorporated in advance into the final MPO. These safety accommodations would decrease the total ore tons mined by widening the ramp road and therefore would be expected to affect the project economics negatively during operations.

Dumping over the pit rim and pushing materials down over the benches has other safety concerns related to the lack of stability the material has before it “locks in” against the opposite pit wall at the toe of the pushed debris fan. This fan of dumped material would likely be pushed downward by bulldozer operators, who would be exposed to potential risks such as overturning equipment, rock avalanches, and burial by unstable material.

Complete Waste Rock Pit Backfill

Under this scenario, waste rock that has not come into contact with process water would be placed back into the pit. The DEIS indicated that maintaining a hydraulic sink was desirable because it would protect groundwater from potential contamination by drawing potentially contaminated groundwater toward the pit, where the amount of water lost to evapotranspiration would exceed the

amount of water flowing in. However, subsequent geochemical analysis of the chemical constituents of tailings and waste rock has indicated that the risk of contaminated seepage from the tailings and waste rock facilities is low. Although a pit lake would provide an additional level of protection against the small risk of groundwater contamination, maintaining a hydraulic sink is no longer the primary reason for eliminating complete pit backfill from detailed consideration.

A complete waste rock pit backfill would require rehandling approximately 881 million tons of material. At a rate of 56 million to 58 million tons per year being moved, this would require approximately 16 years to complete, assuming 24 hours per day, 365 days per year of operations. The cost of such an operation is estimated to be \$654 million to \$996 million. Concurrent reclamation activities would occur on the tailings buttress areas not integrated with waste rock on the eastern and northern areas. All other reclamation activities would be postponed until completion of backfill operations, further delaying final closure. The Rosemont Copper Mine site would remain active for the duration of backfill and reclamation activities. This would include traffic for employees and delivery of materials and supplies for mining activities; continued environmental impacts such as fugitive dust emissions, light, and noise; and consumption of fuels and electricity for an additional 16 years or more.

Because of the extended environmental impacts, financial implications, and safety issues of complete waste rock backfill, the responsible official has determined that complete waste rock pit backfill is not technically, economically, or environmentally feasible.

Partial Pit Backfill

Partial pit backfill would place waste rock that has not come into contact with process water back into the pit to an elevation that would retain a hydraulic sink. To ensure that partial backfilling would not eliminate the hydraulic sink, waste rock would be placed up to an elevation of 3,825 feet above mean sea level inside the pit. Material would be mined from between 5,500 and 5,300 feet above mean sea level and transported back into the pit. The eastern waste rock dump could be reclaimed after backfilling operations are completed. Concurrent reclamation could be completed as contemplated on the northern and eastern edges of the tailings facilities, the southern waste rock facility, and a portion of the waste rock facility below the 5,300-foot elevation. The eastern waste rock dump would be lowered in elevation by about 200 feet; however, no change in the overall operations footprint would occur. Partial pit backfill would require rehandling approximately 84 million tons of material. At a rate of 28 million to 29 million tons per year being moved, this would require approximately 3 years to complete, assuming 24 hours per day, 365 days per year of operations. The cost of such an operation is estimated to be \$84 million to \$112 million. Concurrent reclamation activities would occur on the tailings buttress areas not integrated with waste rock on the eastern and northern areas. All other reclamation activities would be postponed until completion of backfill operations, likely further delaying final closure.

Because of the extended environmental impacts, financial implications, and safety issues of partial waste rock pit backfill, the responsible official has determined that it is not technically, economically, or environmentally feasible.

Reconfiguring or Relocating the Waste Rock and Tailings Facilities

Several alternatives were considered to reconfigure or relocate the waste rock and tailings facilities. The volume of waste rock and tailings is relatively fixed. This is because Rosemont Copper possesses the legal right to access their mineral deposits, and the size of the pit cannot feasibly be reduced beyond what is proposed in the preliminary MPO. Four primary alternatives for relocation or reconfiguration were considered, as follows.

Relocating Waste Rock and Tailings to Existing Mines

Impacts to NFS lands could be reduced by removing the waste rock and tailings offsite. The Coronado contacted three existing mines (Sierrita, Twin Buttes, and Mission) west of the Santa Rita Mountains and inquired whether they would consider receiving this material. None of the mines were amenable to accepting this material. Other off-forest options were constrained by the lack of enough available open land, transportation logistics, or the fact that placement of the materials would move them closer to populated areas.

Avoiding Placement in Drainages

A variety of alternatives evaluated the potential to avoid placing any waste rock or tailings in drainage bottoms. This alternative was constrained by the steep topography in the area and would require perching waste and tailings in numerous smaller locations along the northern slope of the Santa Rita Mountains. This would limit reclamation opportunities because the materials would have to be placed at the angle of repose. Since the uplands consist primarily of steep slopes, they are not conducive to stable, long-term storage of large quantities of tailings and waste rock. Furthermore, this alternative would alter the uplands substantially and would impact the functions and values provided by these areas.

Depositing the Tailings on the Northwestern Slope of the Santa Rita Mountains

This alternative was developed to reduce the visual impact of the waste rock and tailings by placing the tailings in Sycamore Canyon. The tailings would be conveyed over the ridge south of Lopez Pass and placed in a tailings facility. This facility would require rock to be quarried in Sycamore Canyon to provide a source for the containment structure. This alternative was dismissed for two reasons: (1) the tailings would have been visible from the Tucson area; and (2) this alternative created the potential to impact a second watershed and aquifer.

Using a Natural Backfill Configuration

The cooperating agencies met on three occasions to develop an alternative. Some cooperating agencies stated that it would be desirable to configure the waste rock and tailings such that, over geological time, natural erosion would carry all of the material back into the pit. This alternative would require the placement of materials above the pit and in areas considered a core biological area in Pima County's "Sonoran Desert Conservation Plan."¹³ This alternative was dismissed because there is insufficient space above the pit to be able to place the materials and avoid the core biological area.

¹³ See <http://www.pima.gov/cmo/sdcp/index.html> for further information on the "Sonoran Desert Conservation Plan."

Modifying the Life of the Mine

The proposed mine life is estimated at 24.5 to 30 years. This alternative evaluation considers extending the mine life to 40 years or reducing the mine life to 10 years. Both modifications would affect multiple aspects of mining and production: personnel, mining, processing, infrastructure, equipment, operations, onsite and offsite vehicular traffic, and the timing of reclamation and closure. Neither modification would affect the final size of the open pit, waste rock dumps, or tailings piles, unless changes in operating or capital costs affect the mine life reserves,¹⁴ nor would either modification affect the total volume of water used or the final viewshed.

According to Rosemont Copper, the plans to produce and process the minerals were developed to provide a stable operating cost in an economic environment in which copper prices fluctuate. The design for milling equipment was reviewed to determine an efficient combination of grinding equipment that is currently available. A mill capable of processing 75,000 tons per day was determined to be the optimum size with regard to capital investment and production rates (Huss 2009). From this determination, all other equipment and processing schedules were planned. Furthermore, contemporary processing facilities are not designed to be shut down on a daily basis.

Shortening the mine life would reduce the length of time during which mining activities would be carried out but would increase the daily intensity of activities. Lengthening the mine life would reduce the intensity of daily mining activity by spreading it out over a longer period. Modifying the mine life in the manner proposed would not reduce the majority of landscape-level environmental impacts. These types of alternatives are not a standard practice in the mining industry. Rather than using an arbitrary production schedule, mine planning professionals use optimization programs to determine the most favorable mine life using inputs from all of the conditions associated with the mine, such as infrastructure requirements and considerations of ore type, grade, and occurrence. While the alternative is technically feasible, it is not practically feasible.

Change in Scheduled Hours of Operation

Comments received on the DEIS questioned the credibility of the statement that it is not practically feasible to operate a mine on a 12-hour schedule. In response, the Coronado asked its consultants to further evaluate the feasibility of this suggestion. The resulting assessment looked at two scenarios: (1) 12-hour operation with the same production as planned for a 24-hour operation and same mine life; and (2) 12-hour operation with half the production planned for a 24-hour operation and double the mine life.

Twelve-Hour Operation with the Same Production Planned for a 24-Hour Operation and Same Mine Life

Confining all mine production to 12 hours per day while maintaining the total planned production rate would have several environmental, cost, and safety impacts. These are as follows:

- Increased traffic intensity on public and mine roads for the one shift;
- Near doubling of the haul truck and ore/waste handling vehicles fleet with more haul trucks and ore handling equipment, along with more oil, lubricant, and maintenance wastes from more equipment;

¹⁴ This means that as long as the cost of pulling ore out of the ground remains the same as proposed, the feasibility/profitability of retrieving the ore would stay the same and the same amount of ore would be extracted.

- More dust load from haul roads, dump pockets, and conveyors due to operational intensity on the one shift;
- Larger dust suppression mobile equipment needed to address more fugitive dust exposed on wider haul roads;
- A larger ore storage facility with larger conveyor systems; and
- Increased safety issues from the use of bulldozers to push ore into the ore feeders in the ore storage facility and increased mobile equipment operating simultaneously on the mine and haul roads.

The assessment concluded that operating on a 12-hour shift may be technically feasible with increased environmental impacts, safety risk, and capital costs. The Coronado determined that it is not practically feasible due to the negative environmental impacts described.

Twelve-Hour Operation with Half the Production Planned for a 24-Hour Operation and Double the Mine Life

The following environmental impacts would be realized with this scenario:

- Traffic from employees, contractors, vendors, and other personnel would occur over a period that is twice the proposed action's and action alternatives' mine life at approximately the same rate per day, which means personal vehicle fuel consumption over the project life would be twice as great as for the proposed action/action alternatives.
- Blast dust is produced on a per ton basis. Blast explosive used for oxide, sulfide, and overburden is designed to produce a certain run-of-mine fragment size for moving and processing the material. Over the mine life, the dust produced is the same, whether the mine life is doubled or not. If the blast occurs once every 2 weeks instead of once per week, the load on the day the shot is conducted for the 2-week supply would be as high as it is for the proposed action and action alternatives, although it would only occur once every 2 weeks.
- Mine support staff traffic would be marginally smaller, but not half of that for the proposed action or action alternatives. Safety, survey, management, and environmental staff would still tour and inspect the mine at the same level for this scenario as for the proposed action and action alternatives because their oversight responsibility occurs daily, regardless of production. Dust loads on a daily basis for these staff activities would not significantly change. The dust loads would, however, occur over twice as many years and roughly double the total load for life of mine. The same is true of personnel who are not from Rosemont Copper, like safety and environmental inspectors, service providers, and vendors. The intensity would be nearly the same but would occur over twice the proposed action's/action alternatives' mine life.
- Mill shutdowns normally occur once per week for one shift for preventive maintenance or planned repairs. The mill equipment size would be smaller for this scenario than for the proposed action or action alternatives, but the preventive maintenance requires basically the same staff and day shift maintenance crew sizes in either case. Thus, due to the doubled mine life, the traffic load and fuel consumption for onsite and offsite for personnel would be approximately twice as high for this scenario as for the proposed action or action alternatives.
- A concurrent reclamation plan is proposed for dry-stack tailings such that tailings facilities would be covered and revegetated during the mine life instead of waiting until all tailings disposal is completed. This scenario would double the mine life, thereby lengthening the

process of concurrent reclamation and delaying the completion of final reclamation activities for the entire mine site.

In summary, environmental impacts in this scenario would not be halved, compared with the proposed action and action alternatives. In fact, over the life of the mine, some impacts would be greater due to cumulative requirements for staff and operating traffic, both onsite and offsite. Blast-produced dust would constitute the same total load but would be spread out over twice the period for this scenario, compared with the proposed action and action alternatives. Final reclamation would require approximately 49 to 60 years, rather than 24.5 to 30 years, which would contribute to additional fugitive dust during the longer operation period. The assessment concluded that this option may be technically feasible with increased environmental impacts, safety risk, and capital/operating costs. The Coronado determined that it is not practically feasible due to the negative environmental impacts described.

Suspending Operations During High-Wind Events

Comments received on the DEIS pointed out contradictory statements regarding the feasibility of suspending mining operations during high wind or dust events. In response, the Coronado asked its consultants to review these options.

“Mining” in this response refers to blasting, truck haulage, and handling of ores that would be delivered to the mill and heap leach operations for treatment of the ores to recover copper.

With respect to cessation of mining operations due to natural environmental factors (i.e., wind conditions), air quality permits typically specify compliance opacity percentage limits, which by extension dictate the allowable operations that can occur during high winds and the resulting increase in high-opacity conditions. The air quality permit requires cessation when dust loads exceed an opacity compliance level, whether or not there are “high” winds.

Wind velocity and opacity measured on the mine property may not be the same everywhere, due to the physical layout of facilities. Operations may continue in some locations while being required to be temporarily suspended in other areas. From a safety perspective, operators may deem it necessary to cease operations temporarily in a limited area of the mine despite the fact that the winds may occur at levels lower than what would generate opacity that exceeds compliance limits. Safety factors must be considered, as driver visibility may be locally affected, but the effect may not be the same across the entire mine area.

Therefore, the conclusion that was stated in the DEIS has been clarified to state, “It is practically feasible to suspend selected operations temporarily during wind velocities or dust loads that exceed permit compliance conditions in order to comply with air quality permit requirement. This is a standard industry practice” (Kline et al. 2012).

Other environmental factors may cause temporary cessation of mining operations because of safety related conditions. These include lightning and rainfall that cause unsafe outdoor work conditions or unsafe road conditions. Generally, outdoor operations in unprotected areas that would expose mine operators to lightning would cease when lightning is noted within a certain distance of the work area. Rainfall may cause the unpaved mine roads to become too slick for driving or to be affected by washouts. Safety conditions are continuously monitored, and operations would cease temporarily when the mine management deems the conditions dangerous to workers and equipment.

Water Supply

Rosemont Copper has obtained a permit from the ADWR that allows them to pump water up to 6,000 acre-feet of water per year from the Upper Santa Cruz Subbasin to supply the mine, as identified in the preliminary MPO. It is important to note that the ADWR has the authority to permit groundwater pumping for mining purposes, and it is beyond the authority of the Forest Service to require that Rosemont Copper find an alternate source. However, the public, cooperating agencies, and members of the Coronado ID team identified numerous alternate sources of water, as follows:

- Potable sources to the east:
 - Davidson Canyon;
 - Cienega Creek;
 - Sonoita Creek; and
 - San Pedro River.
- Potable sources to the west:
 - Santa Cruz River basin (existing permit in Sahuarita);
 - Other private land adjacent to Santa Cruz River or Sahuarita (buffer distance from residences or businesses);
 - State land groundwater (buffer distance from residences or businesses);
 - Santa Rita Experimental Range groundwater (buffer distance from residences or businesses);
 - Central Arizona Project direct delivery;
 - Tohono O'odham Nation groundwater direct delivery; and
 - Reverse osmosis water from Yuma treatment.
- Localized Central Arizona Project recharge and recovery:
 - Lower Santa Cruz constructed facility (Augusta Resource has some existing credit); and
 - Avra Valley constructed facility (Augusta Resource has some existing credit).
- Nonpotable sources to the west:
 - Green Valley waste water effluent;
 - Nogales waste water effluent;
 - Tucson waste water effluent;
 - Tucson reclaimed water;
 - Sierrita sulfate plume consent water from Freeport-McMoRan Copper and Gold;
 - U.S. Department of the Interior effluent;
 - U.S. Department of the Interior managed recharge credit recovery (not wet water);
 - Deep aquifer brackish water; and
 - Ocean water from Sea of Cortez, desalinated.

The technical and practical aspects of these alternate sources were investigated on behalf of the Coronado by SRK Consulting Inc. (Stone et al. 2011).

A review found that the use of effluent or reclaimed water to offset a portion of groundwater pumping was feasible. However, this option was eliminated from detailed study because: (1) a pipeline or other

water delivery system from the source to the mine site, approximately 50 miles, would increase the degree of environmental and social impacts; (2) there is no guarantee that available excess effluent or reclaimed water would be available; and (3) there is no indication that Rosemont Copper could obtain a guaranteed water right or permit for use of effluent or reclaimed water.

A review found that the use of deep aquifer brackish water was feasible. However, this option was also eliminated from detailed study because: (1) it would require location of an adequate supply of such water, the closest potential location being in Cochise County; (2) a pipeline of approximately 55 miles and pumping stations would be required, which would likely result in additional environmental and social impacts; (3) there is no indication that Rosemont Copper could obtain the necessary rights or permits to use such water; and (4) there is an indication that use of such water in Arizona may depend on reappraisal of the aquifer classification in the State.

A review found obtaining Central Arizona Project direct delivery water to offset groundwater pumping would not be feasible unless Rosemont Copper could acquire a guaranteed Central Arizona Project allocation of municipal and industrial water for the life of the mine. In addition, direct delivery of Central Arizona Project water would require a cistern or construction of a reservoir for water storage, a treatment plant, and a pipeline and water delivery system.

The remaining sources were deemed infeasible or otherwise impractical.

Transportation

Alternatives were considered to the proposed transportation of workers, supplies, and shipments to the mine and primary access road. Several comments suggested that the transportation of materials to the mine could be accomplished by improving the road in Box Canyon. The impacts to Box Canyon that would result from constructing the road such that it could accommodate large trucks were deemed to be greater than the access proposed in the preliminary MPO. Similarly, routing supply trucks to approach the site from the south was also deemed to have a greater impact on resources than the preliminary MPO.

Comments also suggested constructing a rail line directly to the mine site. While constructing a rail spur to the mine site may be technically feasible from an engineering perspective, it is not environmentally or economically feasible. Construction of rail spur would require obtaining a ROW across numerous ownerships and building a railway siding and loading facility at or near the mine, and this would add to the environmental impacts. The alignment of the proposed alternatives would cross ASLD State Trust land, private land, riparian areas, and WUS, would impact threatened, endangered and sensitive wildlife species and habitat, and would result in substantial land disturbance.

Suggestions for other road locations were also provided, including expanding Houghton Road into a 4-lane road from Corona de Tucson to the north side of Tucson; and making the utility maintenance road over Gunsight Pass into the primary access road. Expanding Houghton Road to four lanes is beyond the authority of the Forest Service, and it is not clear how this would lessen transportation impacts. Constructing the utility maintenance road over Gunsight Pass to a standard that is suitable for haul truck traffic would result in greater impacts than the proposed primary access road would. For these reasons, these options were eliminated from detailed study.

Natural Gas Pipeline

Several comments were received that suggested construction of a natural gas pipeline to the site as an alternative to constructing an electric transmission line. This alternative was eliminated from detailed study after consideration of the following:

- Constructing a new natural gas pipeline that would connect with the El Paso Natural Gas pipeline near I-10 would require obtaining ROWs from a variety of private and public landowners, and construction would result in additional ground disturbance. Impacts would include disturbance to cultural resources, protected plants such as Pima pineapple cactus, and habitat for threatened, endangered, and sensitive wildlife species.
- A comment on the DEIS stated that DKRW has proposed constructing a natural gas pipeline with a capacity of 800,00 cubic feet per day along the east side of the Santa Cruz Valley and suggested that a natural gas pipeline could be connected to the DKRW line and co-located with the water supply pipeline running to the mine site. Research indicates that the DKRW and El Paso Corporation planned to build a 350-mile-long pipeline in the State of Sonora, Mexico, to transport natural gas from the Sonora coast to Nogales, Arizona, where it would connect with an El Paso Natural Gas pipeline. An estimated 800,000 cubic feet of natural gas were to be transported into the United States. There is no indication that a new pipeline in the Santa Cruz Valley was proposed or has been constructed.
- The water supply line that runs from Rosemont Copper supply wells to the mine site requires four pump stations to deliver water to the mine site. These pump stations require electricity to operate the pumps, which is provided from the Rosemont substation, which is powered by the proposed electric transmission line. If the electric transmission line were eliminated, Rosemont Copper would be unable to deliver adequate water to operate the mine.
- This scenario would require Rosemont Copper to install a natural gas power plant at their mine site, which would require permitting. Rosemont Copper is not currently permitted as a power generator, and construction and operation of such a plant would require additional surface disturbance, additional Federal and State permits, and would increase air emissions. Overall, the environmental impact would be similar or greater under such an alternative.

Land Exchange or Purchase of the Rosemont Copper Project Area by the Forest Service

Members of the public suggested that a land exchange would reduce the administrative impact of managing a mine on the Coronado National Forest and would remove the permanent placement of mine tailings and waste rock on public lands. Several laws authorize Federal agencies to negotiate transactions in which private lands are exchanged for public land parcels. More recently, Congress has authorized or directed through legislation specific exchanges and other land transactions. Typically, individuals seeking development opportunities have taken the initiative in pursuing such exchanges, often in cooperation with independent land exchange facilitators.

Neither Augusta Resource nor Rosemont Copper has expressed any interest in a land exchange for this project, and the Forest Service has no authority to require this option. Furthermore, this alternative would not result in a change in the preliminary MPO; therefore, it would not reduce environmental impacts.

Purchase of Rosemont Copper's private holdings in the project area would require a willing buyer and a willing seller. Neither Augusta Resource nor Rosemont Copper has expressed any interest in selling its land and mineral rights to the Forest Service.

Downsize Electrical Transmission Line

Following Rosemont Copper's announcement that development of the heap leach facility was not feasible for the Barrel Alternative, the Coronado received comments asking whether a double-circuit 46-kV (two times approximately 60-MW capacity) or a 69-kV (approximately 120-MW capacity) line could meet the reduced demand and should be analyzed as a new alternative. The Coronado consulted with Rosemont Copper and TEP over this issue. Rosemont Copper responded that, according to calculations, there would be reductions in electricity from eliminating the heap leach facility and associated processes, but not to the extent that a lower-kV line could be used.

The total connected load for Rosemont Copper is estimated to be approximately 126 MW and would require a transmission voltage of 138 kV. The estimated demand load is about 96.5 MW, and the estimated operating load is about 92.8 MW. This configuration would still require the use of a 138-kV line to transmit the electricity, which still requires a CEC from the ACC. The load cannot be supported by solar power. Consequently, there would be no change to the configuration of the proposed transmission lines or their alignments. Rosemont Copper went on to state that "TEP chose the appropriate size for the transmission line through a rigorous public process. TEP determined that a 138-kV line is the appropriate size to provide service to Rosemont Copper. Transmission best practices dictate that a line should not be pressed to its upper limit but should have excess capacity."

In a November 11, 2012, article in the Arizona Daily Star, a TEP official stated that "while a 138-kV line has capacity to serve up to 500 MW, its entire system of substations and power transformers in that area can serve no more than 280 MW" (Davis 2012). Also, even though Rosemont Copper's average daily demand is now less than 100 MW, TEP needs a line that can serve Rosemont Copper's total "connected load," or all of the mine's equipment if used at once. That requires 126 MW—more than a double-circuit 46-kV or a single-circuit 69-kV line can serve.

In response to an inquiry from the Coronado's consultant, TEP stated:

The typical capacity for a transmission line of various voltages is as shown below.

Voltage Level Capacity (MW) - 69kV 39; 138kV 156; and 230kV 435

This is based on the line loadability limit of a line under 100 miles in length. As the numbers indicate even two 69kV lines would not be sufficient for the 90+ MW of load proposed by Rosemont. (Beck 2012)

The responsible official considers TEP to have superior expertise in this matter, as they are responsible for constructing the transmission line and providing electricity to the mine. Since TEP has determined that the 138-kV transmission line is appropriate for supplying electricity to the mine, considering the level of electricity needed without the heap leach facility and processes, the responsible official decided to eliminate this alternative from detailed consideration.

Bury Electrical Transmission Line

Several comments were received suggesting that the electrical transmission line be buried as a way of reducing visual impacts. A number of factors were included in the consideration of this alternative. An underground 138-kV line requires a number of ancillary facilities in order to construct and maintain the power line as well as the required cooling instruments. Buried “vaults” are required every 900 to 3,500 feet. A vault is a cement box (10 by 10 by 30 feet) with chimneys to the surface and manholes for ground access. Transition structures are also required to transfer aboveground transmission to underground lines. These structures are 60 to 100 feet tall. Burying the line and vaults would result in a great deal of additional ground disturbance, impacts to listed plant species and wildlife habitat, and direct impacts to cultural sites. After considering the benefits and costs of burying the transmission line, the responsible official decided to eliminate this option from detailed study. The additional impacts to the environment and cultural resources, cost, infrastructure, and ground disturbance outweigh the visual improvement. It is also important to note that the Forest Service does not have jurisdiction to require burying the electrical transmission line outside NFS lands.

Forest Plan Consistency

The FEIS and ROD for the Coronado National Forest, dated August 4, 1986, and the associated “Coronado National Forest Land and Resource Management Plan,” as amended (U.S. Forest Service 1986), were adopted pursuant to the National Forest Management Act (16 U.S.C. 1604) and its implementing regulations at 36 CFR 219¹⁵ to provide strategic direction (desired conditions, goals, and objectives) and to set parameters on land and resource use activities (standards and guidelines). As a forest plan is implemented through time, it periodically becomes necessary to adjust this strategic direction to provide for site-specific land and resource use or activities. Such adjustments, commonly called amendments, may be initiated and adopted by the Forest Supervisor as needed to adapt the forest plan to changing land and resource conditions or management needs.

Forest plans may “be amended in any manner whatsoever after final adoption and after public notice” (16 U.S.C. 1604(f)(4)). Federal regulations at 36 CFR 219.17(b)(3) allow forests to use the provisions of the planning regulations in effect before November 9, 2000, in order to amend forest plans. FSM 1926.5 states that the responsible official shall do the following: (1) determine whether proposed changes to a land management plan are significant or not significant in accordance with the requirements of FSM 1926.51 and 1926.52; (2) document the determination of whether the change is significant or not significant in a decision document; and (3) provide appropriate public notification of the decision prior to implementing the changes. FSM 1926.51 and 1926.52 provide guidance for determining whether changes to land management plans are significant or not significant.

Public notification of the need to amend the Coronado’s forest plan was made in the Notice of Intent to Prepare an Environmental Impact Statement (U.S. Forest Service 2008k) and in the DEIS. Several comments were received on the DEIS regarding the proposed forest plan amendment. Determination of the significance of the proposed amendment has been made by the responsible official and is summarized in this section and further addressed in the ROD.

¹⁵ Established pursuant to the National Forest Management Act of 1976 (16 U.S.C. 1600–1614, August 17, 1974, as amended 1976, 1978, 1980, 1981, 1983, 1985, 1988, and 1990, and its implementing regulations at 36 CFR Part 219 (effective September 30, 1982)).

Findings of the responsible official regarding the consistency of projects or activities and actions with the land management plan and the determination of the significance of an amendment are an integral part of decisions. For this forest plan amendment conducted under the 1982 planning regulations, the responsible official has elected to use the “Optional Procedures Available during the Planning Rule Transition Period” (the former 36 CFR 217 appeal procedures that were in effect prior to November 9, 2000, as accessed through the prior planning regulation transition provisions at 36 CFR 219.35 Appendix A, revised as of July 1, 2010).

A review of the consistency of the Rosemont Copper Project resulted in a determination that certain aspects of implementing the proposed action (preliminary MPO) or any of the action alternatives would result in conditions that are inconsistent with management direction in the current forest plan. Figure 26 shows the forest plan management areas within the project area. Table 8 provides an overview of the types of inconsistencies identified.

Table 8. Coronado National Forest Plan consistency considerations

Management Direction Category	Rosemont Copper Project Consistency with Forest Plan Management Direction – Alternatives 2 through 6
Forestwide Standards and Guidelines	Inconsistent with standards and guidelines related to the following: <ul style="list-style-type: none"> Maintenance, rehabilitation, and enhancement of visual resources Protection of cultural resources Maintenance and improvement of wildlife habitat Maintenance and protection of existing riparian resources Maintenance of wildlife and plant diversity Maintaining buffers around watering and feeding areas Retention of riparian area Amount of riparian area Diversity of riparian species Maintenance of riparian area productivity Minimizing soil damage Maintenance of Recreation Opportunity Spectrum classes
Management Area 1 Standards and Guidelines	Inconsistent with standards and guidelines related to the following: <ul style="list-style-type: none"> Maintenance of visual resources Maintenance and improvement of wildlife habitat Maintenance of vegetative structure Loss of horizontal structure Loss of vertical structure Delisting threatened and endangered species and reoccupying historic habitat Recreation Opportunity Spectrum settings: semiprimitive motorized and nonmotorized
Management Area 4 Standards and Guidelines	Inconsistent with standards and guidelines related to the following: <ul style="list-style-type: none"> Maintenance of Recreation Opportunity Spectrum classes Maintenance of visual resources Maintenance and improvement of wildlife habitat
Management Area 7 Standards and Guidelines (Applies to Management Prescriptions A and B)	Inconsistent with standards and guidelines related to the following: <ul style="list-style-type: none"> Maintenance of Recreation Opportunity Spectrum classes Maintenance of visual resources Maintenance and improvement of wildlife habitat

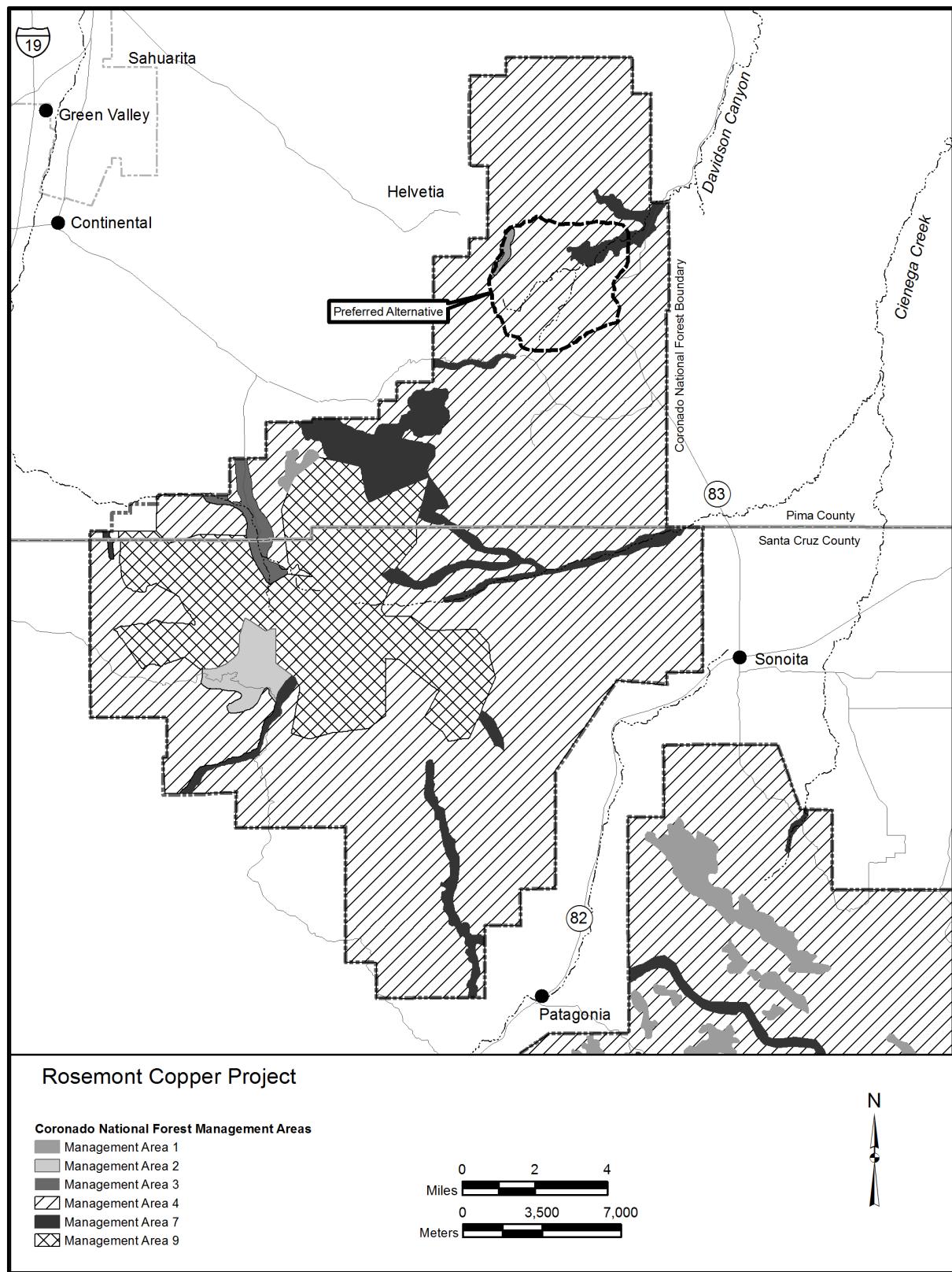


Figure 26. Designated management areas, Coronado National Forest

The Coronado proposes to amend its forest plan in order to address the inconsistencies of the proposed project with current standards and guidelines. The proposed forest plan amendment would create a new management area for which direction specific to copper mining will apply. A detailed description follows.

The proposed new management area would be designated “Management Area 16 – Rosemont Mining Area.” It would include standards and guidelines specifically developed to rectify conflicts between activities associated with copper mining and the existing forest plan, as amended. Further changes, if any, necessitated by the final decision would be addressed in the ROD. All mining and associated ground-disturbing activities associated with the Rosemont Copper Project would be located within the boundaries of proposed management area 16, with the exception of some access road construction, construction of the electric and water lines and associated maintenance road segments, and the movement of employees, materials, and mine products.

Proposed Forest Plan Amendment

Management Area 16 – Rosemont Mining Area

Management Emphasis and Intensity

This management area is an administrative delineation that provides for mining of privately held mineral resources while allowing other forest uses to the degree that they are safe, practical, and appropriate for an active mining or postmine environment.

Management Area Description

The land is within the Sycamore Canyon and Davidson Canyon subwatersheds, located on the Nogales Ranger District, which is within or immediately adjacent to the area containing mining and related activities for the Rosemont Copper Project. This management area contains no suitable timber land, old-growth forest, or spotted owl or goshawk habitat, and it contains 10,528 acres of land that is currently capable for grazing (premine conditions). Management Area 16 includes lands formerly in forest management areas 1, 4, and 7.

The management area standards and guidelines that follow (table 9) apply to management area 16 and supersede inconsistent forestwide plan language identified in table 8.

Table 9. Management prescriptions for Coronado National Forest Management Area 16

Management Practices	Standards and Guidelines
Dispersed Recreation	<ol style="list-style-type: none"> Access for exploration and development of locatable mineral resources will be analyzed in response to a proposed operating plan. Potential impacts will be considered in reviewing proposed MPOs. The area within the perimeter fence that encloses active mining operations will generally be closed to public use until such a time that mining and reclamation activities are completed. Trails will be evaluated to determine whether their continued use is warranted, given mining activities and postmine conditions.
Visual Resource Management	<ol style="list-style-type: none"> Mine reclamation should consider using a geomorphic approach that results in landforms similar to adjacent natural terrain and hydrologic functions similar to natural systems in order to minimize long-term monitoring and maintenance requirements. Mining activities should incorporate reclamation measures that reduce contrasts with the surrounding landscapes.

Management Practices	Standards and Guidelines
Wildlife and Fish	<ol style="list-style-type: none"> 1. Mitigate impacts on wildlife and plant diversity by applying the following standards and guidelines to the appropriate management activities. <ol style="list-style-type: none"> a. Mineral entry and oil and gas exploration <ol style="list-style-type: none"> i. To the extent practical, leave buffers around watering and feeding areas for escape and hiding cover. Buffer widths vary with the site but must be wide enough to screen affected wildlife from the project site. ii. Rehabilitate site using mixture of forage and cover plant species. iii. Within occupied habitat of threatened and endangered species, specific recommendations for habitat management are made on a site by site basis, in consultation with USFWS.
Range Management	<ol style="list-style-type: none"> 1. Following completion of mining and reclamation activities, evaluate areas excluded from grazing to determine capability for livestock grazing. 2. Consider future livestock grazing when selecting and approving seed and plants for revegetation.
Watershed and Soil Maintenance and Improvement	<ol style="list-style-type: none"> 1. To the extent practicable, mining facilities and reclamation should strive to emulate natural hydrologic functions. 2. Mine reclamation revegetation treatments will be conducted using primarily native species. Species will be approved by the Forest Service prior to use.
Minerals Management	<ol style="list-style-type: none"> 1. To the extent possible, avoid construction of permanent roads across Federal lands unless needed for future access. 2. Mineral exploration and extraction activities will be allowed within the framework of applicable laws and regulations, including environmental laws and regulations designed to mitigate the impacts of mining activities. Emphasis will be on gaining cooperation and control through the use of operating plans and bonds for reclamation to protect and restore NFS surface resources, where practicable.
Lands Administration	<ol style="list-style-type: none"> 1. Approved occupancy on NFS lands for mining purposes is restricted to site security measures. Permanent structures and/or occupancy are limited to only those that are necessary and incidental to approved mining operations.
Road Maintenance	<ol style="list-style-type: none"> 1. Roads located within the perimeter fence will be closed to public access pending mine closure and reclamation.

Capability Area Types

See management areas 1, 4, and 7 for this information. Total acreage equals 10,528.

The direct, indirect, and cumulative environmental effects of those activities are described in the resource sections of chapter 3 of this FEIS.

Implementation of the proposed forest plan amendment would not significantly alter the multiple-use goals and objectives of the current forest plan. The amendment proposes changes in management direction to allow mining and associated activities to occur in the Rosemont area and adjacent lands (within the management area 16 boundary) only. These activities are restricted in geographic extent and would not have wide-ranging effects across the Coronado National Forest.

Management area 16 would replace those portions of existing management areas 1, 4, and 7 where they overlap (figure 27). Therefore, the total acreage of these existing management areas would be reduced on a forestwide basis, as shown in table 10. Management prescriptions for these management areas would not change. Significant changes in the multiple-use goals and objectives for long-term land and resource management are not expected.

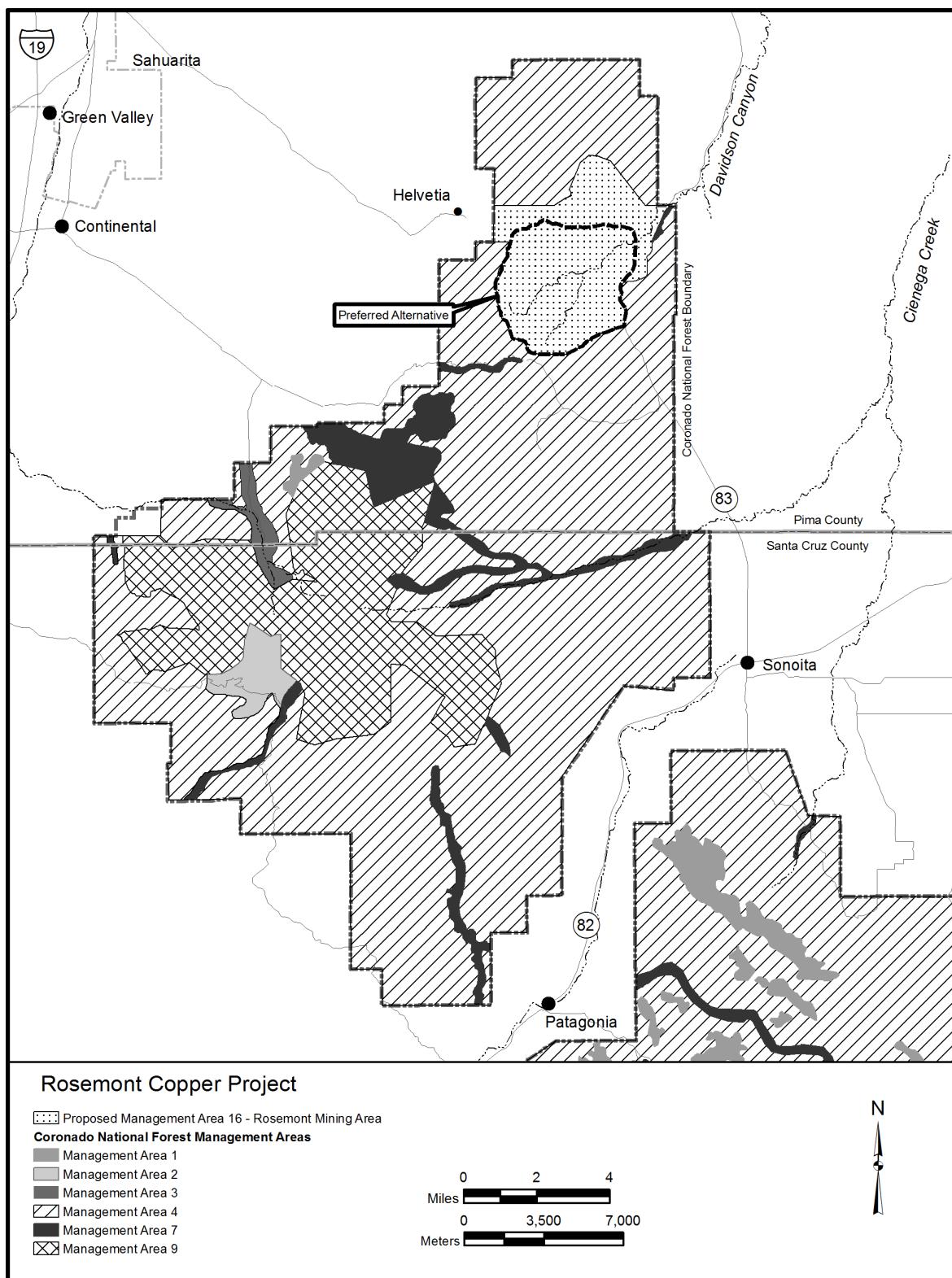


Figure 27. Proposed Coronado National Forest Management Area 16 – Rosemont Mining Area

Table 10. Reduction in existing management areas

Existing Management Area	Current Acreage Forestwide (Forest Plan, Table 2A)	Acres Forestwide with Adoption of Management Area 16	Net Reduction (acres and percent)
1	97,772 acres	97,593 acres	179 acres (0.18%)
4	1,126,289 acres	1,116,904 acres	9,385 acres (0.84%)
7	41,547 acres	40,583 acres	964 acres (2.38%)

The reduction in acres of management areas 1, 4, and 7 is expected to have minimal effects on the output of goods and services across the Coronado National Forest.

Finding of Significance

An analysis of the proposed amendment finds that it would meet the criteria specified in FSM 1926.51 and therefore would not be a significant amendment to the Coronado forest plan. Further information is provided in the ROD.

Forest Plan Revision

The current forest plan was originally developed in 1986, more than 25 years ago. The Coronado is currently in the process of revising the 1986 plan. This process began in 2006, and many necessary changes were identified in collaboration with the public. A working draft of the revised forest plan was released in March 2010. Further public review will occur in 2013, with the release of a proposed draft forest plan and DEIS. A decision on the revised forest plan is anticipated in early 2014.

The ROD for the Rosemont Copper Project is being issued prior to completion of the forest plan revision. Therefore, the Rosemont Copper Project must comply with the existing forest plan. As previously mentioned, the proposed Rosemont Copper Project forest plan amendment is intended to resolve conflicts between activities associated with copper mining and the 1986 forest plan, as amended.

When the forest plan revision process is complete, the revised plan will replace the current amended forest plan. Coordination between the forest plan revision effort and the forest plan amendment associated with the Rosemont Copper Project ROD is ongoing to ensure that conflicts would be minimal should the Rosemont Copper Project be implemented.

Alternatives Impact Summary

Table 11 compares the basic elements of disturbance for the action alternatives to assist in understanding various components that form the overall alternative disturbance. The acres of disturbance provided in table 11 were determined using the best available information and GIS modeling. The results have been used in all impact analyses in chapter 3 that included surface disturbance.

Table 11. Alternatives comparison table: disturbance elements

Disturbance Element	Proposed Action (preliminary MPO)	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Security fence disturbance area – all area within security fence	4,387	4,308	4,228	4,688	5,045
Primary access road corridor – 600 feet wide to allow for designed cut areas (outside security fence)	263	194	226	225	192
Utility line corridor – 500 feet wide for transmission with others co-located – water line and utility maintenance road – 150-foot corridor where not within transmission line, except for the designated 30- to 40-foot easement or ROW (outside security fence)	899	897	899	899	899
Road disturbance – outside security fence New Roads – 100 feet wide Decommissioned Roads – 14 feet wide	39 14	59 12	39 20	39 17	1 42
Arizona National Scenic Trail – 8 feet wide trail plus trailheads	11	11	19	19	19
Total Disturbance Area (acres)	5,612	5,481	5,431	5,888	6,197
Total Area Excluded from Public Access (acres) – within the Perimeter Fence	6,177	6,073	6,990	6,994	8,889

Table 12 summarizes the impacts of each alternative based on the issues, as stated in chapter 1, which drove the analysis. Because the elements that were analyzed may not have an issue statement that drove their analysis (see chapter 1), those items are noted as “Other Effects Considered.” Through the impact analysis process, ID team members determined some additional factors that should be considered in the overall analysis used to compare alternative effects. A more thorough and detailed discussion of impacts is provided in chapter 3 of the FEIS.

Table 12. Alternatives impact summary

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Schlofield-McCleary
Geology, Minerals, and Paleontology						
Other Effects Considered						
Amount of rock removed (tons)	None	1.83 billion*	1.85 billion [†]	1.91 billion [‡]	1.85 billion	1.85 billion
Potential loss of paleontological resources (moderate to high potential class/sensitive acres disturbed)	No effect from proposed mine	2,876	2,904	3,202	3,541	2,449
Qualitative assessment of geotechnical and seismic stability of pit	Not applicable	Failure is unlikely because of the design criteria for expected seismic activity	Same as proposed action	Same as proposed action	Same as proposed action	Same as proposed action
Qualitative assessment of potential for disturbance of cave resources	No effect from proposed mine	No disturbance to known caves; geological formations have low potential for caves; therefore, it is unlikely that unknown resources would be impacted	Same as proposed action	Same as proposed action	Same as proposed action	Same as proposed action
Soils and Revegetation						
Issue 1.1: Qualitative assessment of long-term stability of tailings and waste rock facilities, including expected results of reclamation	None	Modeling indicates that waste rock and tailings would be more stable than required by regulations	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 1.2: Acres and quantitative level of disturbance leading to lost soil productivity	No changes from the proposed mine. Disturbance from grazing, recreation use, and fire activity would continue. Recreation use and fire activity would increase with population and climate change.	5,612	5,481	5,431	5,888	6,197
Issue 1.3: Qualitative assessment of the potential for revegetation of tailings and waste rock facilities	None	Onsite test plots and greenhouse studies indicate that revegetation can produce a vegetation volume that is similar to historic climax conditions under proper management	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 1.4: Qualitative evaluation of alteration of soil productivity and soil development	None	Soil productivity would be reclaimed following placement of soil or soil/rock cover and revegetation, with the exception of 955 acres of mine pit	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 1.5: Tons per year of sediment delivery to Davidson Canyon, Cienega Creek, or other streams and washes, compared with background sediment loading	32,600	16,000	16,500	22,170	20,300	24,200
Air Quality and Climate Change						
Issue 2.1: PM _{2.5} versus background and threshold	No change resulting from the proposed mine. Fugitive dust and emissions expected to increase with population.	Premining: 0.7% increase in Pima County annual emissions Active mining: 4× increase versus background levels; complies with NAAQS at perimeter fence	Same as for proposed action	Same as for proposed action	Same as for proposed action	Premining: 0.7% increase in Pima County annual emissions Active mining: 6× increase versus background levels; exceedance of the NAAQS at perimeter fence
Issue 2.1: PM ₁₀ versus background and threshold	No change resulting from the proposed mine. Fugitive dust and emissions expected to increase with population.	Premining: 0.7% increase in Pima County annual emissions Active mining: 3× increase versus background levels; exceedance of the NAAQS at perimeter fence	Same as for proposed action	Premining: 0.7% increase in Pima County annual emissions Active mining: 3× increase versus background levels; complies with NAAQS at perimeter fence	Premining: 0.7% increase in Pima County annual emissions Active mining: 4× increase versus background levels; exceedance of the NAAQS at perimeter fence	Premining: 0.7% increase in Pima County annual emissions Active mining: 4× increase versus background levels; exceedance of the NAAQS at perimeter fence

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Issue 2.2: Greenhouse gas emissions versus background	No change resulting from the proposed mine. Greenhouse gas emissions expected to increase with population.	Premining: <0.1% increase in Pima County CO ₂ emissions Active mining: ~1% increase in Pima County CO ₂ emissions	Approximately the same as for proposed action	Approximately the same as for proposed action	Approximately the same as for proposed action	Approximately the same as for proposed action
Issue 2.3: VOC emissions	No change resulting from the proposed mine. VOC emissions expected to increase with population.	Premining: Emission rate of <1 ton per year Active mining: Less than 1% increase in Pima County VOC emissions; emission rate of about 86 tons per year	Premining: Emission rate of <1 ton per year Active mining: Less than 1% increase in Pima County VOC emissions; emission rate of about 86 tons per year	Premining: Emission rate of <1 ton per year Active mining: Less than 1% increase in Pima County VOC emissions; emission rate of about 82 tons per year	Premining: Emission rate of <1 ton per year Active mining: Less than 1% increase in Pima County VOC emissions; emission rate of about 88 tons per year	Premining: Emission rate of <1 ton per year Active mining: Less than 1% increase in Pima County VOC emissions; emission rate of about 94 tons per year
Issue 2.3: NO _x emissions	No change resulting from the proposed mine. NO _x emissions expected to increase with population.	Premining: <0.1% increase in Pima County NO _x emissions Active mining: 3.4% increase in Pima County NO _x emissions; emission rate of about 1,200 tons per year	Same as for proposed action	Same as for proposed action	Premining: <0.1% increase in Pima county NO _x emissions Active mining: 3.6% increase in Pima County NO _x emissions; emission rate of about 1,250 tons per year	Premining: <0.1% increase in Pima County NO _x emissions Active mining: 3.9% increase in Pima County NO _x emissions; emission rate of about 1,360 tons per year
Issue 2.4: Meeting of air quality standards	No change resulting from the proposed mine. Continued monitoring and regional emission reduction efforts likely to maintain compliance with NAAQS.	Exceedance of PM ₁₀ NAAQS at perimeter fence	Same as for proposed action	Complies with all NAAQS at perimeter fence	Exceedance of PM ₁₀ NAAQS at perimeter fence	Exceedance of PM _{2.5} and PM ₁₀ NAAQS at perimeter fence
Issue 2.5: Effects on air quality in Class I airsheds	No change resulting from the proposed mine. Effects on Class I airsheds expected to increase with population.	Emissions do not exceed Class I increment thresholds; may contribute to degradation of air quality related values in the Saguaro National Park East, Saguaro National Park West, and Galiuro Wilderness Area Class I airsheds	Same as for proposed action	Same as for proposed action	Emissions do not exceed Class I increment thresholds; may contribute to degradation of air quality related values in the Saguaro National Park East and Galiuro Wilderness Area Class I Airsheds	Same as for proposed action
Groundwater Quantity						
Davidson Canyon/Cienega Basin						
Issue 3A.1: Direction and feet of change in water table level	Potential changes owing to increased basin water use and potential changes owing to climate change could reduce groundwater availability	More than 100-foot drawdown near mine pit within several years; springs in close proximity to pit (Fig Tree, Scholefield, Rosemont) experience over 10 feet of drawdown within the active mining phase; distant surface waters (Gardner Canyon, Davidson Canyon, Cienega Creek) unlikely to experience substantial drawdown over any time period, with the exception of Empire Gulch, which could experience several feet of drawdown beginning 50 years or more after closure of the mine; residences in Corona de Tucson unlikely to experience drawdown over 5 feet; residences along Singing Valley Road could experience over 10 feet of drawdown within 20 years of closure of the mine; residences along Hilton Ranch Road could see up to 10 feet of drawdown within 20 years of closure of the mine.	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3A.3: Geographic extent in which water resources may be impacted						
Issue 3A.2: Relative impairment of mountain-front groundwater recharge function	None	About 35 acre-feet, per year, in perpetuity	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3A.4: Duration of effect (in years)	None	Perpetuity	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3A.5: Comparison of mine pit water loss by evaporation with overall basin water balance	None	Total dewatering loss during active mining of 13,000 to 18,500 acre-feet; annual water loss in perpetuity of 170 to 370 acre-feet, which is equivalent to ~3% of basin recharge	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Issue 3A.6: Potential reduction in subsurface groundwater outflow from Davidson Canyon to Cienega Creek owing to climate change	Potential reduction owing to climate change	Maximum reduction of 11.7% based on estimated surface flow reduction	Maximum reduction of 11.3% based on estimated surface flow reduction	Maximum reduction of 4.4% based on estimated surface flow reduction	Maximum reduction of 10.7% based on estimated surface flow reduction	Maximum reduction of 5.8% based on estimated surface flow reduction
Issue 3A.7: Approximate number of wells within geographic extent of impact	None	360 to 370	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Upper Santa Cruz Subbasin						
Issue 3B.1: Water needed for operations from Santa Cruz Valley and comparison with other water uses and basin water balance, measured in acre-feet	None	Total water use of 99,600 acre-feet, with permitted water use up to 120,000 acre-feet. Annual water use of 5,400 acre-feet during first 8 years represents an increase of 6.7% in area pumping	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3B.2: Direction and feet of change in water table level	Water-level declines from 3.5 to 6.5 feet per year in vicinity of water supply wells	Additional water-level declines from 1.5 to 3.5 feet per year due to pumping; total drawdown of 90 feet in vicinity of wells due to pumping	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3B.3: Geographic extent in which water resources may be impacted	None	3 to 4 miles from pumping center	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3B.4: Duration of effect (in years)	None	100 to 140 years	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3B.5: Potential for subsidence to occur as a result of groundwater withdrawal	Continue of current rate of decline 0.7 to 1.4 inches per year	The incremental withdrawal for the mine water supply would contribute to the overall groundwater withdrawal and land subsidence in the Sahuarita area	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3B.6: Approximate number of wells within geographic extent of impact	None	500 to 550	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Groundwater Quality and Geochemistry						
Issue 3C.1: Ability to meet Arizona Aquifer Water Quality Standards at points of compliance designated in the aquifer protection permit	Concentrations of arsenic in some ambient groundwater samples exceed aquifer water quality standards	Modeled water quality for potential seepage from tailings and waste rock meets standards; modeled water quality from lined heap leach exceeds standards for cadmium, fluoride, and selenium but would not be discharged; treatment of heap leach with an engineered biological system meets standards; modeled water quality in mine pit lake exceeds the aquifer water quality standard for thallium and potentially ammonia, but the standard is not applicable to pit lakes	Same as for proposed action	Same as for proposed action, with exception of heap leach, which has been removed from Barrel	Same as for proposed action	Same as for proposed action
Issue 3C.2: Ability to demonstrate best available demonstrated control technology	None	Best available demonstrated control technology has been accepted through the aquifer protection permit process and has been determined to be adequate*	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Other Effects Considered						
Impact to Sierrita sulfate plume	None	Minor changes in gradient or groundwater levels as a result of mine supply pumping would occur in the vicinity of the Sierrita sulfate plume. Overall direction of flow, location of plume, and effectiveness of control are not expected to be affected.	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Surface Water Quantity						
Issue 3D.1: Quantitative assessment of water released and available for beneficial uses	No change	Beneficial uses of ephemeral stream flows primarily related to stock tanks; after mitigation, negligible effect on beneficial uses	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3D.4: Number of stock watering tanks that would be unavailable	0	11 stock tanks directly lost; 6 stock tanks possibly indirectly impacted downstream, but reduction in flow due to mine unlikely to affect tanks	11 stock tanks directly lost; 6 stock tanks possibly indirectly impacted downstream, but reduction in flow due to mine unlikely to affect tanks	15 stock tanks directly lost; 5 stock tanks possibly indirectly impacted downstream, but reduction in flow due to mine unlikely to affect tanks	15 stock tanks directly lost; 5 stock tanks possibly indirectly impacted downstream, but reduction in flow due to mine unlikely to affect tanks	5 stock tanks directly lost; 6 stock tanks possibly indirectly impacted downstream, but reduction in flow due to mine unlikely to affect tanks

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Issue 3D.5: Change in volume, frequency, and magnitude of runoff from the project area	Possible reduction owing to climate change	Postclosure 45.8% reduction in average annual volume of stormwater flow; 53.1% reduction in 100-year, 24-hour peak stormwater flow; 9.7% reduction in stormwater flow in lower Davidson Canyon. Approximately 30 to 50% reduction during operations.	Postclosure 44.3% reduction in average annual volume of stormwater flow; 49.9% reduction in 100-year, 24-hour peak stormwater flow; 11.1% reduction in stormwater flow in lower Davidson Canyon Approximately 30 to 50% reduction during operations.	Postclosure 17.2% reduction in average annual volume of stormwater flow; 22% reduction in 100-year, 24-hour peak stormwater flow; 4.3% reduction in stormwater flow in lower Davidson Canyon Approximately 30 to 40% reduction during operations.	Postclosure 42.0% reduction in average annual volume of stormwater flow; 40.0% reduction in 100-year, 24-hour peak stormwater flow; 10.5% reduction in stormwater flow in lower Davidson Canyon Approximately 30 to 50% reduction during operations.	Postclosure 22.8% reduction in average annual volume of stormwater flow; 29.5% reduction in 100-year, 24-hour peak stormwater flow; 5.7% reduction in stormwater flow in lower Davidson Canyon Approximately 30 to 50% reduction during operations.
Issue 3D.6: Change in recharge to the aquifer by runoff	Possible reduction owing to climate change	Reduction in recharge to shallow alluvial aquifers possible but cannot be quantified. Overall loss of mountain-front recharge to aquifer about 35 acre-feet per year, in perpetuity.	Reduction in recharge to shallow alluvial aquifers possible but cannot be quantified. Overall loss of mountain-front recharge to aquifer about 35 acre-feet per year, in perpetuity.	Reduction in recharge to shallow alluvial aquifers possible but cannot be quantified. Overall loss of mountain-front recharge to aquifer about 35 acre-feet per year, in perpetuity.	Reduction in recharge to shallow alluvial aquifers possible but cannot be quantified. Overall loss of mountain-front recharge to aquifer about 35 acre-feet per year, in perpetuity.	Reduction in recharge to shallow alluvial aquifers possible but cannot be quantified. Overall loss of mountain-front recharge to aquifer about 35 acre-feet per year, in perpetuity.
Surface Water Quality						
Issue 3E.1: Ability to meet Arizona Surface Water Quality Standards	Current runoff does not meet Arizona Surface Water Quality Standards for total silver, arsenic, copper, lead, selenium, thallium, and dissolved copper	Runoff from waste rock is predicted to meet Arizona Surface Water Quality Standards for all constituents except dissolved silver; risk of exceedance is mitigated by waste rock segregation techniques and suggests that dissolved silver would likely be below standards as well	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3E.2: Change in geomorphology and characteristics of downstream channels	No changes from proposed mine. Changing watershed or climatic conditions could alter stream channels.	Sediment load would decrease, but sediment concentrations would remain the same, compared with baseline; analysis indicates that no changes in geomorphology (scour/aggradation) are expected in Barrel Canyon or Davidson Canyon owing to change in sediment load	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3E.3: Acres and locations that may be affected by surface water quality impacts and duration (in years) of those impacts	None	Runoff would affect 2.5 miles of Barrel Canyon (23 acres), and 14 miles of Davidson Canyon (234 acres); potential for effect is greatest during active mine life (20 to 25 years), gradually reducing as reclamation occurs	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 3E.4: Acres of potentially jurisdictional WUS impacted	0	79.4	79	68.4	84.1	48.9

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Seeps, Springs, and Riparian Areas						
Issue 3D.2: Number of stream miles changed from intermittent/perennial flow status to ephemeral flow status as a result of the project	None predicted; increased population growth and climate change could have a continued impact on perennial waters similar to trends currently observed	<p>Empire Gulch, about 3 miles impacted <u>Low estimate:</u> No or minor changes up to 150 years after closure; ephemeral by 1,000 years after closure <u>Best-fit models:</u> Mixed results showing intermittent or ephemeral by 150 years after closure; all models indicate ephemeral by 1,000 years after closure <u>High estimate:</u> Ephemeral by 50 years after closure</p> <p>Cienega Creek, about 20 miles impacted <u>Low estimate:</u> No or minor changes predicted. <u>Best-fit models:</u> Mixed results, with one model showing no or minor changes through 1,000 years, one model showing intermittent conditions by 1,000 years, and one model showing intermittent conditions by 150 years and ephemeral conditions by 1,000 years <u>High estimate:</u> Minor change predicted up to 50 years after closure; intermittent by 150 years after closure; ephemeral by 1,000 years after closure</p> <p>Davidson Canyon: No change predicted</p> <p>Gardner Canyon, about 1 mile impacted <u>Low estimate:</u> No change predicted <u>Best-fit models:</u> No or minor changes predicted up to 150 years after closure. Mixed results at 1,000 years, ranging from no change to ephemeral. <u>High estimate:</u> Minor changes predicted up to 50 years after closure; intermittent by 150 years after closure; ephemeral by 1,000 years after closure</p> <p>Intermittent streams: Some intermittent streams associated with springs in Sycamore Canyon (north), Sycamore Canyon (south), Box Canyon, and Mulberry Canyon may be impacted</p>	Same as for proposed action			
Issue 3D.3: Quantitative assessment of potential lowering of the water table/reduced groundwater flow to Davidson Canyon and Cienega Creek that results in permanent changes in flow patterns and that may affect their Outstanding Arizona Water* designations and current designated uses	None predicted; increased population growth and climate change could have a continued impact on perennial waters similar to trends currently observed	<p>Upper Cienega Creek: Up to 50 years after closure of the mine, most modeling scenarios show no predicted effects At 150 years after closure, some modeling scenarios show no or minor changes in flow, and some modeling scenarios show that there may be transition from perennial to intermittent flow, and increased duration of extremely low-flow conditions At 1,000 years after closure, modeling scenarios are mixed, showing a range of outcomes, including minor changes in flow, transition from perennial to intermittent flow, and transition from perennial to ephemeral flow. All modeling scenarios show increased duration of extremely low-flow conditions.</p> <p>Davidson Canyon and Lower Cienega Creek: None predicted; reduction in surface runoff could change recharge to shallow alluvial aquifer; distance downstream makes impacts highly uncertain. Some water quality constituents potentially elevated in runoff, but potential is reduced by waste rock segregation procedures.</p>	Same as for proposed action			

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Issue 4.1: Acres of riparian areas disturbed, by vegetation classification	None predicted; increased population growth and climate change could have a continued impact on perennial waters similar to trends currently observed	Pima County Mapped Riparian Habitat directly disturbed = 686 acres Barrel Canyon = 162 acres of xeroriparian habitat expected to be indirectly impacted with high certainty Empire Gulch = 407 acres of hydroriparian habitat could be indirectly impacted Davidson Canyon (Reach 2) = 502 acres of xeroriparian habitat expected to be indirectly impacted with moderate certainty No riparian habitat is expected to be indirectly impacted along Cienega Creek, Gardner Canyon, or lower Davidson Canyon An additional 14 riparian areas associated with springs would be directly or indirectly disturbed with high certainty; and an additional 35 riparian areas associated with springs may be indirectly disturbed but with less certainty	Pima County Mapped Riparian Habitat directly disturbed = 649 acres Indirect impacts to Barrel Canyon, Empire Gulch, Davidson Canyon, and Cienega Creek are the same as for proposed action Riparian impacts associated with springs are the same as for proposed action	Pima County Mapped Riparian Habitat directly disturbed = 588 acres Indirect impacts to Barrel Canyon, Empire Gulch, Davidson Canyon, and Cienega Creek are the same as for proposed action An additional 13 riparian areas associated with springs would be directly or indirectly disturbed with high certainty; and an additional 36 riparian areas associated with springs may be indirectly disturbed but with lower certainty	Pima County Mapped Riparian Habitat directly disturbed = 633 acres Indirect impacts to Barrel Canyon, Empire Gulch, Davidson Canyon, and Cienega Creek are the same as for proposed action Riparian impacts associated with springs are the same as for Barrel Alternative	Pima County Mapped Riparian Habitat directly disturbed = 631 acres Indirect impacts to Barrel Canyon, Empire Gulch, Davidson Canyon, and Cienega Creek are the same as for proposed action; an additional 19 riparian areas associated with springs would be directly or indirectly disturbed with high certainty; and an additional 32 riparian areas associated with springs may be indirectly disturbed but with lower certainty
Issue 4.2: Number of seeps and springs degraded or lost	None predicted; increased population growth and climate change could have a continued impact on perennial waters similar to trends currently observed	Seven springs directly lost due to surface disturbance; 10 springs highly likely to be indirectly impacted due to drawdown; 59 springs may be indirectly impacted due to drawdown, but water source is unknown; 19 springs unlikely to be impacted	Eight springs directly lost due to surface disturbance; nine springs highly likely to be indirectly impacted due to drawdown; 59 springs may be indirectly impacted due to drawdown, but water source is unknown; 19 springs unlikely to be impacted	Five springs directly lost due to surface disturbance; 11 springs highly likely to be indirectly impacted due to drawdown; 60 springs may be indirectly impacted due to drawdown, but water source is unknown; 19 springs unlikely to be impacted	Same as for Barrel Alternative	Thirteen springs directly lost due to surface disturbance; 9 springs highly likely to be indirectly impacted due to drawdown; 56 springs may be indirectly impacted due to drawdown, but water source is unknown; 17 springs unlikely to be impacted
Issue 4.3: Change in the function of riparian areas	None predicted; increased population growth and climate change could have a continued impact on perennial waters similar to trends currently observed	Hydroriparian habitat along Empire Gulch would transition to mesoriparian or xeroriparian Pockets of mesoriparian habitat along Davidson Canyon (Reach 2) could transition to mesoriparian or xeroriparian with moderate certainty Xeroriparian habitat in lower Barrel Canyon highly certain to experience reduced vitality, extensiveness, and health and to transition to lesser quality habitat Along Upper Cienega Creek, widespread transition from hydroriparian to xeroriparian habitat is unlikely, but contraction of hydroriparian habitat could occur with conversion at the transitional margins	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 4.4: Qualitative assessment of ability to meet legal and regulatory requirements for riparian areas [†]	Increased population growth and climate change could have a continued impact on perennial waters similar to trends currently observed	Upper Cienega Creek: Six criteria assessed for impacts to Outstanding Arizona Waters. Few changes predicted up to 50 years after closure, but some risk in changes of flow and frequency of low-flow conditions in the long-term (see Issue 3D.3). Low-flow conditions could affect biological characteristics under wadeable, perennial standards. Davidson Canyon and Lower Cienega Creek: Seven criteria assessed for impacts to Outstanding Arizona Waters. Full analysis of ability to meet water quality requirements Davidson Canyon is not possible, but screening analysis suggests that some constituents may be elevated in stormwater. This potential is reduced by several safety factors, including waste rock segregation requirements. Otherwise, no predicted changes that would affect Outstanding Arizona Waters or biological characteristics protected under wadeable, perennial standards. Geomorphological changes unlikely to affect bottom deposit characteristics protected under wadeable, perennial standards.	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Biological Resources						
Issue 5A.1: Acres of terrestrial vegetation permanently lost or altered, by vegetation type*	No change from the proposed mine	5,612 acres permanently lost or altered; see table 122 for breakdown by vegetation type	5,481 acres permanently lost or altered; see table 122 for breakdown by vegetation type	5,431 acres permanently lost or altered; see table 122 for breakdown by vegetation type	5,888 acres permanently lost or altered; see table 122 for breakdown by vegetation type	6,197 acres permanently lost or altered; see table 122 for breakdown by vegetation type
Issue 5B.1: Acres by type of terrestrial and aquatic habitat lost, altered, or indirectly impacted	No change from the proposed mine	Refer to table 108 (in “Seeps, Springs, and Riparian Areas” resource section) and table 123 for detailed information regarding these impacts	Same as for proposed action			
Issue 5B.2: Qualitative assessment of impacts on aquatic habitats and surface water that supports wildlife and plants such as stock tanks, seeps, and springs	No change from the proposed mine, but increased population growth and climate change could have an impact	Hydroriparian habitat in Empire Gulch could be impacted, including transition from perennial to intermittent or ephemeral stream flow, mortality of individual species, reduced vegetation volume, and possibly transition to mesoriparian or xeroriparian habitat. Impacts to hydroriparian habitat along Cienega Creek and Davidson Canyon are possible but not the most likely scenario. Aquatic and riparian habitat associated with 7 springs would be lost due to direct surface disturbance; 10 springs are highly likely to be indirectly impacted due to groundwater drawdown and would likely cease functioning as viable habitat; and 59 springs may be indirectly impacted due to drawdown, but their water source is unknown. Direct loss of habitat associated with 11 stock tanks.	Same as for proposed action, except direct disturbance of 8 springs, highly likely indirect impacts to 9 springs, possible indirect impacts to 59 springs.	Same as for proposed action, except direct disturbance of 5 springs, highly likely indirect impacts to 11 springs, possible indirect impacts to 60 springs, and direct loss of 15 stock tanks.	Same as for Barrel Alternative	Same as for proposed action, except direct disturbance of 13 springs, highly likely indirect impacts to 9 springs, and possible impacts to 56 springs, and direct loss of 5 stock tanks.
Issue 5B.3: Qualitative assessment of how changes in the function of riparian areas could impact wildlife habitat†	No change from the proposed mine	Changes in cover, foraging efficiency and success, reproductive success, growth rates of young, and predator-prey relationships	Same as for proposed action			
Issue 5C.1: Acres of disturbance that could create conditions conducive for invasive species	No change from the proposed mine	5,612 acres disturbed in the project area; an additional 162 acres of xeroriparian habitat in Barrel Canyon, 502 acres of xeroriparian habitat in Davidson Canyon, and 407 acres of hydroriparian habitat in Empire Gulch could be indirectly impacted by reduced surface water flows and groundwater drawdown resulting conditions conducive to invasive species	5,481 acres disturbed in the project area; an additional 162 acres of xeroriparian habitat in Barrel Canyon, 502 acres of xeroriparian habitat in Davidson Canyon, and 407 acres of hydroriparian habitat in Empire Gulch could be indirectly impacted by reduced surface water flows and groundwater drawdown resulting conditions conducive to invasive species	5,431 acres disturbed in the project area; an additional 162 acres of xeroriparian habitat in Barrel Canyon, 502 acres of xeroriparian habitat in Davidson Canyon, and 407 acres of hydroriparian habitat in Empire Gulch could be indirectly impacted by reduced surface water flows and groundwater drawdown resulting conditions conducive to invasive species	5,888 acres disturbed in the project area; an additional 162 acres of xeroriparian habitat in Barrel Canyon, 502 acres of xeroriparian habitat in Davidson Canyon, and 407 acres of hydroriparian habitat in Empire Gulch could be indirectly impacted by reduced surface water flows and groundwater drawdown resulting conditions conducive to invasive species	6,197 acres disturbed in the project area; an additional 162 acres of xeroriparian habitat in Barrel Canyon, 502 acres of xeroriparian habitat in Davidson Canyon, and 407 acres of hydroriparian habitat in Empire Gulch could be indirectly impacted by reduced surface water flows and groundwater drawdown resulting conditions conducive to invasive species
Issue 5D.1: Qualitative assessment of the change in movement corridors and connectivity between wildlife habitats	No change from the proposed mine	Increase movement habitat fragmentation and disrupt dispersal and migration patterns of species using five animal movement corridors; restore small amount of three movement corridors due to decommissioning of roads	Same as for proposed action	Increase movement habitat fragmentation and disrupt dispersal and migration patterns of species using six animal movement corridors; restore small amount of three movement corridors due to decommissioning of roads	Same as for Barrel Alternative	Increase movement habitat fragmentation and disrupt dispersal and migration patterns of species using six animal movement corridors; restore small amount of four movement corridors due to decommissioning of roads
Issue 5D.2: Qualitative assessment of mortality of various animal species resulting from increased volume of traffic related to mine operations	No change from the proposed mine	Animal mortality would likely increase for some species types but could decrease for other species types (depending on local wildlife populations and natural histories of species encountering roads) during mine construction and active mine operations	Same as for proposed action			
Issue 5E.1: Acres of habitat disturbed for each special status species, including impacts to designated and proposed critical habitat	No change from the proposed mine	5,612 acres lost or converted; refer to table 123 for detailed information regarding these impacts; refer to species’ narratives in “Environmental Consequences” section for discussions of impacts to designated or proposed critical habitat	5,481 acres lost or converted; refer to table 123 for detailed information regarding these impacts; refer to species’ narratives in “Environmental Consequences” section for discussions of impacts to designated or proposed critical habitat	5,431 acres lost or converted; refer to table 123 for detailed information regarding these impacts; refer to species’ narratives in “Environmental Consequences” section for discussions of impacts to designated or proposed critical habitat	5,888 acres lost or converted; refer to table 123 for detailed information regarding these impacts; refer to species’ narratives in “Environmental Consequences” section for discussions of impacts to designated or proposed critical habitat	6,197 acres lost or converted; refer to table 123 for detailed information regarding these impacts; refer to species’ narratives in “Environmental Consequences” section for discussions of impacts to designated or proposed critical habitat

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Issue 5E.2: Potential to affect the population viability of any species	No change from the proposed mine	Individuals may be impacted, but loss of population viability is not likely	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 5F.1: Acres of habitat impacted from noise, vibration, and light	No change from the proposed mine	Up to 146,163 acres [‡] impacted	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 5F.2: Qualitative assessment of effects on wildlife behavior from noise, vibration, and light	No change from the proposed mine	Changes in habitat use, timing of activity patterns, inter- and intra-specific communication, foraging efficiency and success, reproductive success, and predator-prey relationships	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Livestock Grazing						
Other Effects Considered						
Issues Analyzed: Impact to Allotments						
Acres of change from fully to partially capable within Rosemont allotment	0	4,156	4,085	4,040	4,454	3,835
Acres of change from fully to partially capable within Thurber allotment	0	204	204	178	230	0
Acres of change from fully to partially capable within Greaterville allotment	0	19	19	<1	1	0
Acres of change from fully to partially capable within DeBaud allotment	0	8	0	0	0	1,031
Acres of change from fully to partially capable within Helvetia allotment	0	<1	<1	9	<1	0
Acres of change from fully to partially capable within Stone Springs allotment	0	0	0	0	0	77
Acres of change from fully to not capable within Rosemont allotment	0	955	955	955	955	955
Stock ponds lost	0	11	11	15	15	5
Springs impacted	0	76	76	76	76	79
Potential reduction in AUMs each year over 25-year mine life	0	900 to 919	900 to 919	862 to 919	975 to 1,001	1,009 to 1,045
Dark Skies						
Issue 8.1: Fractional increase in sky brightness from mine facility and vehicle lighting at Whipple Observatory	No impact, but subject to regional trends and conditions	524% increase in sky brightness at horizon; 28% increase at 10 degrees above horizon; 10% increase at 20 degrees above horizon; 1% increase at 90 degrees above horizon	Slight increase over Barrel Alternative due to heap leach facilities	83% increase in sky brightness at horizon; 8% increase at 10 degrees above horizon; 3.3% increase at 20 degrees above horizon; 0.4% increase at 90 degrees above horizon	Slight increase over Barrel Alternative due to heap leach facilities	Slight increase over Barrel Alternative due to heap leach facilities
Issue 8.1: Fractional increase in sky brightness from mine facility and vehicle lighting at Jarnac Observatory	Same as Whipple	Undetermined increase at horizon due to overlap with light from city of Nogales; 63% increase at 10 degrees above horizon; 22% increase at 20 degrees above horizon; 2% increase at 90 degrees above horizon	Slight increase over Barrel Alternative due to heap leach facilities	Undetermined increase at horizon due to overlap with light from city of Nogales; 21% increase at 10 degrees above horizon; 8% increase at 20 degrees above horizon; 0.7% increase at 90 degrees above horizon	Slight increase over Barrel Alternative due to heap leach facilities	Slight increase over Barrel Alternative due to heap leach facilities
Issue 8.1: Fractional increase in sky brightness from mine facility and vehicle lighting at Sonoita	Same as Whipple	363% increase in sky brightness at horizon; 31% increase at 10 degrees above horizon; 12% increase at 20 degrees above horizon; 1% increase at 90 degrees above horizon	Slight increase over Barrel Alternative due to heap leach facilities	76% increase in sky brightness at horizon; 10% increase at 10 degrees above horizon; 4% increase at 20 degrees above horizon; 0.1% increase at 90 degrees above horizon	Slight increase over Barrel Alternative due to heap leach facilities	Slight increase over Barrel Alternative due to heap leach facilities

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Issue 8.1: Fractional increase in sky brightness from mine facility and vehicle lighting at Corona de Tucson	Same as Whipple	425% increase at 5 degrees above horizon; 119% increase at 10 degrees above horizon; 31% increase at 20 degrees above horizon; 3% increase at 90 degrees above horizon (project area is blocked by terrain and is therefore provided for closest degree visible above horizon)	Slight increase over Barrel Alternative due to heap leach facilities	28% increase at 10 degrees above horizon; 11% increase at 20 degrees above horizon; 0.1% increase at 90 degrees above horizon (project area is blocked by terrain and is therefore provided for closest degree visible above horizon)	Slight increase over Barrel Alternative due to heap leach facilities	Slight increase over Barrel Alternative due to heap leach facilities
Issue 8.1: Fractional increase in sky brightness from mine facility and vehicle lighting at SR 83	Same as Whipple	Project area was determined to be below the horizon and therefore not measured at horizon; 400% increase at 10 degrees above horizon; 141% increase at 20 degrees above horizon; 25% increase at 90 degrees above horizon	Slight increase over Barrel Alternative due to heap leach facilities	4,000% increase in sky brightness at horizon; 117% increase at 10 degrees above horizon; 39% increase at 20 degrees above horizon; 9% increase at 90 degrees above horizon	Slight increase over Barrel Alternative due to heap leach facilities	Slight increase over Barrel Alternative due to heap leach facilities
Issue 8.1: Fractional increase in sky brightness from mine facility and vehicle lighting at Empire Ranch	Same as Whipple	2,530% increase in sky brightness at horizon; 105% increase at 10 degrees above horizon; 32% increase at 20 degrees above horizon; 4% increase at 90 degrees above horizon	Slight increase over Barrel Alternative due to heap leach facilities	1,200% increase in sky brightness at horizon; 24% increase at 10 degrees above horizon; 10% increase at 20 degrees above horizon; 1% increase at 90 degrees above horizon	Slight increase over Barrel Alternative due to heap leach facilities	Slight increase over Barrel Alternative due to heap leach facilities
Visual Resources						
Issue 7.1: Acres that would no longer meet current forest plan scenic integrity objectives designations	No impact	4,387	4,308	4,228	4,688	5,045
Issue 7.2: Qualitative assessment/degree of change in landscape character from analysis viewpoints over time: open-pit impacts	No impact	Strong contrasts and adverse impacts from highly visible pit face and diversion channel	Similar to proposed action, but more visible in early years and slightly less visible permanently	Pit face and diversion channel permanently visible	Same as for Barrel Alternative	More adverse impacts than proposed action because of open views of pit face and diversion channel
Issue 7.2: Qualitative assessment/degree of change in landscape character from analysis viewpoints over time: waste rock and tailings impacts	No impact	Permanent, major, adverse impacts from highly visible piles	Permanent, major, adverse impacts from highly visible piles; scree slopes and increased pile visibility would increase adverse contrasts	Same as for proposed action	Same as for proposed action	Same as for proposed action, but also visible from west side of Santa Rita Mountains
Issue 7.2: Qualitative assessment/degree of change in landscape character from analysis viewpoints over time: processing facility impacts	No impact	Facility exposed to view for up to 7 years, then screened by waste rock and tailings	Facility exposed to view for 12 years, then screened by waste rock and tailings	Facility visible for approximately 10 years, then partially screened by waste rock and tailings	Same as for Barrel Alternative	Visible for entire mine lifetime
Issue 7.2: Qualitative assessment/degree of change in landscape character from analysis viewpoints over time: power transmission line impacts	No impact	Adversely visible on the west side of Santa Rita Mountains and over the ridgeline for life of the project	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 7.3: Miles of SR 83 with direct line-of-sight views of the project area	No impact	3.4	3.5	3.9	4.9	3.5
Issue 7.4: Miles of project area visibility along concern level 1 and 2 roads and trails	No impact	28.5	29.3	42.5	39.6	39.8
Other Effects Considered						
Acres of project area regional visibility	No impact	187,893	245,038	264,795	260,589	763,295
Miles of Arizona National Scenic Trail (west side of SR 83) with direct line-of-sight views of the project area	No impact	2.8*	2.8*	NA†	NA†	NA†
Miles of realigned Arizona National Scenic Trail (east side of SR 83) with direct line-of-sight views of the project area	No impact	NA†	NA†	8.7‡	8.1‡	7.9‡

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Recreation and Wilderness						
Issue 9.1: Acres that would no longer meet current forest plan Recreation Opportunity Spectrum designations	0.0	6,177	6,073	6,990	6,994	8,885*
Issue 9.1: Acres of semiprimitive nonmotorized	0.0	0	0	0	0	130
Issue 9.1: Acres of semiprimitive motorized	0.0	5,942	5,838	6,177	6,178	8,487
Issue 9.1: Acres of roaded modified	0.0	170	170	169	169	0
Issue 9.1: Acres of roaded natural	0.0	65	65	644	647	268
Issue 9.2: Acres of Coronado National Forest unavailable for recreational use	No change	6,177	6,073	6,990	6,994	8,885
Issue 9.2: Miles of NFS roads lost	0.0	17.5	17.5	18.5	18.5	28.5
Issue 9.3: Qualitative assessment of potential for noise to reach recreation areas	No change	Generally 40 dB or less; industrial noise would be noticed near the perimeter fence, including much of the Arizona National Scenic Trail	Same as for proposed action	Same as for proposed action, except noise would not be evident from most of the Arizona National Scenic Trail	Same as for Barrel Alternative	Same as for Barrel Alternative
Issue 9.4: Qualitative assessment of impacts to solitude in designated wilderness and other backcountry areas	No change	Little or no change to solitude because the majority of lands designated as semi-primitive motorized, designated wilderness, and primitive areas are beyond 4 miles and would likely not be affected	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 9.5: Annual hunter days lost (per year) [†]	0	775	775	775	775	775
Issue 9.5: Percent of hunt unit 34A on forest lands affected	0.0%	4%	4%	4%	5%	5%
Issue 9.6: Miles of Arizona National Scenic Trail relocated [‡]	0.0	7.3	7.3	12.8	12.8	12.8
Issue 9.7: Qualitative assessment of increased pressure on other areas	No change from the proposed project, although population growth is anticipated to gradually increase demand for recreation opportunities	Moderate increase in use expected to nearby areas such as Happy Valley, Gardner Canyon, Louisiana Gulch, Ophir Gulch, and Carouleau Gap	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Hazardous Materials						
Other Effects Considered						
Potential for release of ammonium nitrate and fuel oil during use	None	Materials consumed during detonation; negligible risk to environment	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Potential for release of laboratory reagents during storage or use	None	Materials used in small quantities in controlled setting; negligible risk to environment	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Potential for release of cleaning fluids during storage or use	None	Materials used in small quantities in controlled setting; negligible risk to environment	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Potential for release of reagents during solvent extraction and electrowinning	None	Except for kerosene and sulfuric acid, all reagents used up in process or used in small amounts; negligible risk to environment	Same as for proposed action	None	Same as for proposed action	Same as for proposed action
Potential for release of ammonium nitrate from risk of explosion during storage	None	In dry form presents little risk for release or migration; by itself and properly stored does not present an unusual risk of fire or explosion; negligible risk to environment	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Potential for release of hazardous waste	None	When stored, transported, and disposed of properly does not pose risk of accidental release; petroleum products described separately; negligible risk to environment	Same as for proposed action	Reduced risk, compared with proposed action, because of removal of the heap leach and oxide facilities	Same as for proposed action	Same as for proposed action

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Potential for catastrophic release of sulfuric acid or petroleum product during transportation	None	Direct impacts to plants, wildlife, and/or soil in immediate vicinity of spill; possible migration into surface waters with indirect downstream effects on vegetation, aquatic species, and/or wildlife; some risk of groundwater contamination	Same as for proposed action	Reduced potential risk, compared with proposed action, because of removal of the heap leach and oxide facility	Same as for proposed action	Same as for proposed action
Potential for catastrophic or major release of sulfuric acid or petroleum product within the mine	None	Direct impacts to soil and wildlife and if long-term release, high potential for groundwater contamination; unlikely to migrate beyond the boundaries of the mine as a result of hydrologic gradients; direct impacts to birds and wildlife from pit contamination	Same as for proposed action	None for sulfuric acid, less than proposed action for petroleum products because of the removal of the oxide facilities	Same as for proposed action	Same as for proposed action
Potential release of contaminants from failure of leach pad	None	Direct impacts to groundwater from sulfuric acid; unlikely to migrate beyond the boundaries of the mine as a result of hydrologic gradients; direct impacts to birds and wildlife from pit contamination	Same as for proposed action	None	Same as for proposed action	Same as for proposed action
Fuels and Fire Management						
Other Effects Considered						
Risk of Activities Increasing Ignition						
Blasting	None	Low	Low	Low	Low	Low
Increased vehicle traffic	None	Increased risk of accidental ignition along transportation routes	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Storage and transportation of flammable materials	None	Increased risk of accidental ignition along transportation routes	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Construction	None	Low	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Effects of Activities on Fuel Loading						
Clearing of vegetation	None	Low	Low	Low	Low	Low
Noxious weeds	None	Minor additional fuel loading after mitigation	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Decrease in groundwater level	None	Minor	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Transportation/Access						
Other Effects Considered						
Issue 12.1: Change in type and pattern of traffic by road and vehicle type	No change in type and pattern of traffic from the proposed mine. Changes from population would depend on type and location of corresponding development.	Increase in truck and passenger car traffic from mine related traffic on analyzed highway routes	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 12.2: Quantitative assessment of the change in level of service on potential highway routes	Increase in anticipated traffic volume from population growth. No change in level of service (therefore, no effect).	Decrease in level of service for some intersections and roadway segments but would not decrease to an unacceptable level of service. Mitigation measures would reduce the impacts of mine related traffic.	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Issue 12.3: Quantitative assessment of roads decommissioned by the mine and roads lost to motorized access*	No change in transportation routes; therefore, no effect from the proposed mine. Travel management planning on the Nogales Ranger District could affect roads that are available for public motorized access on NFS lands.	32.7 miles of existing NFSRs decommissioned; 17.5 miles of NFSRs restricted by mine operations	32.9 miles of existing NFSRs decommissioned; 17.5 miles of NFSRs restricted by mine operations	35.0 miles of existing NFSRs decommissioned; 18.5 miles of NFSRs restricted by mine operations	Same as for Barrel Alternative	46.9 miles of existing NFSRs decommissioned; 28.5 miles of NFSRs restricted by mine operations
Noise						
Issue 9.3: Qualitative assessment of potential for noise to reach recreation areas and expected noise level	None	Impacts to recreational users from intermittent blasting noise (construction and mining operation phases) and equipment operational noise (mining operation phase), resulting in a likely decrease in recreational value in the area immediately surrounding the project area (premining and active mining phases)	Same as for proposed action	Same as for proposed action, other than relocated Arizona National Scenic Trail, where noise impacts would not be evident	Same as for Barrel Alternative	Same as for Barrel Alternative
Issue 11B.1: Ability of alternatives to meet rural landscape expectations	Likely to meet expectations	For all action alternatives: no impacts to residents from construction, blasting, equipment operation, or traffic noise during any phase of mine life	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Public Health and Safety						
Issue 10.1: Qualitative assessment of public health risk from mine operations and facilities	None	None; public is excluded from mine operations and facilities by perimeter fence	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 10.2: Qualitative assessment of public health risk from geological hazards	No change resulting from proposed mine. Continued ground water pumping in the Santa Cruz Valley resulting from population increases could result in subsidence.	Geological hazards are unlikely, with the exception of land subsidence in the Santa Cruz valley, which could be marginally increased by mine supply pumping	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 10.3: Qualitative assessment of public health risk from noise and vibration	None	Acute noise hazards from construction, traffic, equipment, or blasting are unlikely	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 10.4: Quantitative assessment of ability to meet air quality standards for human health	No change resulting from proposed mine. Increased traffic and emissions related to population growth would occur.	NAAQS are met at the perimeter fenceline	Same as for proposed action	Same as for proposed action	NAAQS are not met at the perimeter fenceline	NAAQS are not met at the perimeter fenceline
Issue 10.5: Quantitative assessment of the potential change in traffic accidents	Increase in anticipated traffic accidents owing to increased traffic from population growth.	A potential increase of 9 to 14 additional traffic accidents per year on SR 83 during the year with the highest projected traffic volume: active mining phase year 1*	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Issue 10.6: Trip count per day for all hazardous materials and qualitative assessment of potential effects	None	Up to 157 weekly trips for all hazardous materials shipments. Direct impacts primarily from potential release of petroleum products, ammonium nitrate, or sulfuric acid, but risk of accidental release is low. If occurring, onsite ammonium nitrate explosion could cause damage up to 2 miles away and release a plume of toxic gases. Onsite petroleum product fire or sulfuric acid release could cause a plume of smoke and/or toxic gases. Accident during transportation could affect a radius of up to 0.5 mile for sulfuric acid, fuels, and ammonium nitrate and a radius of up to 1 mile for explosives.	Same as for proposed action	94 weekly trips for all hazardous materials shipments (63 fewer than proposed action as a result of removal of heap leach and oxide plant facilities)	Same as for proposed action	Same as for proposed action
Issue 10.7: Qualitative assessment of impacts on local emergency response to accidents or spills on public roadways	No change resulting from proposed mine. Increased development associated with population growth could result in more shipments of hazardous materials, which could result in accidents or spills that require emergency response.	Increased potential of hazardous materials accidents or spills on public roadways and therefore potential increased frequency for emergency responses	Same as for proposed action	Less than other action alternatives due to reduced hazardous materials shipments	Same as for proposed action	Same as for proposed action
Cultural Resources						
Issue 6A.1: Number of historic properties buried, destroyed, or damaged	0	85	83	82	106	76
Issue 6A.2: Potential for vibrations to damage historic properties	No impact from proposed mine	Very unlikely	Very unlikely	Very unlikely	Very unlikely	Very unlikely
Issue 6A.3: Qualitative assessment of impacts on historic properties	No impact from proposed mine	Notable impact	Notable impact	Notable impact	Notable impact	Notable impact
Issue 6B.1: Number of impacted prehistoric sites known/likely to have human remains	0	31	30	30	36	15
Issue 6B.2: Number of historic sites likely to have human remains	0	3	3	3	3	3
Issue 6C.1: Number of sacred springs impacted	0	17	17	16	16	22
Issue 6C.2: Qualitative assessment of impact on Native Americans of desecration of land, springs, burials, and sacred sites	No impact from proposed mine	Notable impact	Notable impact	Notable impact	Notable impact	Notable impact
Issue 6D.1: Acres of traditional resource collection areas impacted	0	6,177	6,073	6,990	6,994	8,889
Issue 6D.2: Qualitative assessment of the impacts on other non-tribal communities in the region in terms of impacts on resources, such as historical townsites, cemeteries, mines, ranches, and homesteads	No impact from proposed mine	Notable impact	Notable impact	Notable impact	Notable impact	Notable impact

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Socioeconomics and Environmental Justice						
Issue 11A.1: Change in employment over time	No change from the proposed mine. Changes in employment are expected to be consistent with current and projected trends.	Regional increase in employment: Premining phase Pima County – 594 direct jobs and 443 indirect jobs per year; Three-county analysis area – 768 direct and 453 indirect jobs per year. Active mining and reclamation/closure Pima County – 434 direct jobs and 1,260 indirect jobs per year; Three-county analysis area – 434 direct jobs and 512 indirect jobs per year.	Same as for proposed action			
Issue 11A.2: Change in property values over time	No change from the proposed mine. Changes in property values are expected to be consistent with current and projected trends.	Potential decrease in area property values between 4 and 11% within 5 miles of the project area. Potential impacts include more than \$6.4 million in losses to property values.	Same as for proposed action			
Issue 11A.3: Change in tax base per year over time	No change from the proposed mine. Changes in tax base are expected to be consistent with current and projected trends.	Regional increase in tax base. \$11 million in construction sales tax during construction. Total direct local and State revenues over the life of the mine are estimated at \$136.7 million.	Same as for proposed action			
Issue 11A.4: Change in demand and cost for State road maintenance over time	No change from the proposed mine. Changes in demand and costs for State road maintenance are expected to be consistent with current and projected trends.	Increase in funding needs during operation phase of mine. Partially offset by increased tax dollars from more fuel consumption by heavy trucks.	Same as for proposed action			
Issue 11A.5: Change in demand and cost for emergency services over time	No change from the proposed mine. Changes in demand and cost for emergency services are expected to be consistent with current and projected trends.	Potential change in population is not expected to result in dramatic demands on public services and emergency services costs. However, the increase in overall traffic could lead to more accidents and an increase in demand for emergency services over time.	Same as for proposed action			
Issue 11A.6: Quantitative assessment of change in tourism and recreation revenue over time	No change from the proposed mine. Changes in tourism revenue are expected to be consistent with current and projected trends.	Direct effects on nature-based tourism in the greater Tucson area are expected to include an estimated \$1.1 million to \$3.8 million reduction in visitor spending per year. Indirect effects in the greater Tucson area are expected to include an estimated \$511,000 to \$1.7 million reduction in output per year. Estimated 15 to 50% decrease in nature-based tourism from 0 to 10 miles from proposed mine per year.	Direct effects: \$1.0 to \$3.6 million reduction in visitor spending per year. Indirect effects: \$472,600 to \$1.6 million reduction in output per year. 15 to 50% decrease in nature-based tourism from 0 to 10 miles from proposed mine per year.	Direct effects: \$1.4 to \$4.7 million reduction in visitor spending per year. Indirect effects: \$621,900 to \$2.1 million reduction in output per year. 15 to 50% decrease in nature-based tourism from 0 to 10 miles from proposed mine per year.	Direct effects: \$1.6 to \$5.4 million reduction in visitor spending per year. Indirect effects: \$721,500 to \$2.4 million reduction in output per year. 15 to 50% decrease in nature-based tourism from 0 to 10 miles from proposed mine per year.	Direct effects: \$1.6 to \$5.5 million reduction in visitor spending per year. Indirect effects: \$731,400 to \$2.4 million reduction in output per year. 15 to 50% decrease in nature-based tourism from 0 to 10 miles from proposed mine per year.
Issue 11A.7: Qualitative assessment of economic effect on the astronomy industry	No change from the proposed mine. Changes in astronomy industry are expected to be consistent with current and projected trends.	Increased night sky brightness could result in an impairment of observatories near the project area, which could result in a decrease in State revenues generated from astronomy, space, and planetary research and tourism. The negative public perception of having a copper mine next to an observatory may impact observatory revenues.	Same as for proposed action			

Issue Category	No Action	Proposed Action	Phased Tailings	Barrel	Barrel Trail	Scholefield-McCleary
Issue 11B.1: Qualitative assessment of the ability of alternatives to meet rural landscape expectations as expressed by Federal, State, and local plans	No change from the proposed mine, but projected population growth is expected to gradually impact quality of life by putting additional pressures on the rural landscape and natural amenities of the region.	Potential impact to area quality of life resulting from altered landscapes	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action
Issue 11B.2: Quantitative assessment of economic effects on amenity-based relocation	No change from mine construction or operation. Rates of amenity migration are expected to continue consistent with current and projected trends.	0.08% decrease in net migration to Santa Cruz County as a percentage of county population. 6 to 33% decrease in the rate of population growth in the Patagonia Census County Division (CCD). However, the decrease in amenity-based migration may be offset by the increase in mine staff relocation. Impacts on amenity migration in Pima County and the greater Tucson area are expected to be negligible owing to the more dynamic nature of the metropolitan economy.	Same as for proposed action	Same as for proposed action, except for a 0.09% decrease in net migration to Santa Cruz County as a percentage of county population, and a 6 to 37% decrease in the rate of population growth in Patagonia CCD.	Same as Barrel Alternative	Same as for proposed action, except for a 0.09% decrease in net migration to Santa Cruz County as a percentage of county population, and a 6 to 38% decrease in the rate of population growth in Patagonia CCD.
Other Effects Considered						
Environmental Justice: Impacts to populations protected by Title VI of the Civil Rights Act	No change (therefore, no effect)	Possible disproportionate effects on the Tohono O'odham Nation, as well as on the other consulting tribes, with regard to disturbance to cultural resources	Same as for proposed action	Same as for proposed action	Same as for proposed action	Same as for proposed action

For “Geology, Minerals, and Paleontology”

* Source: Huss (2007).

† Source: Huss (2009).

‡ Source: M3 Engineering and Technology Corporation (2012).

For “Groundwater Quality and Geochemistry”

* As noted in the text, the aquifer protection permit would eventually be revised to reflect whatever mine scenario is described in the final MPO. It is assumed that the control technologies for individual discharging facilities would remain the same as those in the approved aquifer protection permit.

For “Seeps, Springs, and Riparian Areas”

* The State of Arizona has the sole authority to make a determination about whether or not the proposed project would violate State water quality regulations by degrading Outstanding Arizona Waters. The person seeking authorization for a regulated discharge to a tributary to, or upstream of, an Outstanding Arizona Water (in this case Rosemont Copper) has the responsibility to demonstrate to the State of Arizona that the regulated discharge will not degrade existing water quality in the downstream Outstanding Arizona Water. This demonstration by Rosemont Copper, and determination by the State of Arizona, has not yet been completed. Independent of this determination, the potential for degradation of Outstanding Arizona Waters was raised by the public as an issue of importance, and therefore the Forest Service has the responsibility under NEPA to take a “hard look” at the potential for degradation. The analysis in this FEIS uses criteria developed by the Forest Service to assess this potential using available information; however, the State of Arizona would make their own determination using their own regulatory criteria and the information available to them at the time, which could differ from that used by the Forest Service.

† This analysis reflects the criteria developed and analyzed by the Forest Service, which will differ from those used by the State of Arizona to make their determination of the ability of the proposed project to meet regulatory requirements.

For “Biological Resources”

* See table 121 for breakdown of impacts to vegetation type by landownership.

† Riparian area disturbance refers to acreage potentially affected indirectly by groundwater drawdown or reduction in surface flows. Direct impacts from surface disturbance are analyzed in the “Surface Water Quality” section.

‡ See table 117 for acreages of vegetation community by landownership within the analysis area.

For “Visual Resources”

* This mileage reflects the distance of Arizona National Scenic Trail located on the west side of SR 83 with direct-line-of sight views of mining operations. This trail location is only proposed for the proposed action and Phased Tailings Alternative and is much closer to the mine, which would result in additional impacts to trail users along this portion of the trail.

† Not applicable (NA) indicates alternatives that would not be affected by the east or west reroute of the Arizona National Scenic Trail, respectively. For example, the rerouted Arizona National Scenic Trail on the west side of SR 83 is not being proposed for the Barrel, Barrel Trail, and Scholefield-McCleary Alternatives. Conversely, the rerouted Arizona National Scenic Trail on the east side of SR 83 is not proposed for the proposed action and Phased Tailings Alternative.

‡ This mileage reflects the distance of Arizona National Scenic Trail located on the east side of SR 83 with direct line-of-sight views of mining operations. This trail location is proposed for the Barrel, Barrel Trail, and Scholefield-McCleary Alternatives. This rerouted portion of the trail was intentionally located much farther from mining operations, and the trail was sited to maximize the user experience. Therefore, although the distance of direct line-of-sight views is longer than the east side trail alternative, the impacts to users would be exponentially reduced due to distance (from mining operations) and obstruction from topography, vegetation, and SR 83.

For “Recreation and Wilderness”

* The acres that would no longer meet current forest plan Recreation Opportunity Spectrum designations for the Scholefield-McCleary Alternative do not match the acres within the perimeter fence because 4 acres are on Rosemont Copper private lands, where Recreation Opportunity Spectrum designations do not apply.

† Hunter days lost for white-tailed deer, javelina, and Mearn’s quail (Heffelfinger n.d. [2011]).

‡ Distances reflect miles of new trail that would be rerouted.

For “Transportation/Access”

* Decommissioned roads include all roads on NFS lands or for which the Coronado holds ROWs that would be decommissioned with the alternatives, regardless of whether they are currently open to public motorized use. Miles of roads lost to motorized access includes those roads that are currently open to motorized use by the public and that would no longer be available for public motorized use.

For “Public Health and Safety”

* It is important to understand that traffic accidents are the result of numerous variables that cannot be predicted with any certainty; therefore, these projections provide a simple mathematical extrapolation and should be taken as such.

For “Cultural Resources”

Note: Includes mine area within security fence, compliance dam locations, primary access road, utilities/maintenance corridor, water corridor where it is not co-located, new forest roads, and the rerouted Arizona National Scenic Trail and new trailheads.