



Socioeconomic Effects Technical Report

**Resolution Copper Mine Environmental
Impact Statement**

REPORT

Report

November 12, 2018

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Resolution Copper Mine Environmental Impact Statement

Prepared for

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SECTION I.

Overall Economic and Fiscal Effects

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Overall Economic and Fiscal Effects

Background

The proposed Resolution Mine presents a number of socioeconomic issues which required research, analysis and modeling. This report provides greater detail and documentation regarding the socioeconomic effects that will be summarized in the Draft EIS.

BBC used the IMPLAN regional economic input-output modeling system to help analyze the potential effects of Resolution Copper Company's (RCM's) proposed mine. Two IMPLAN analyses have previously been undertaken regarding the mine. Elliott Pollack & Company (EPC) conducted an analysis of the statewide effects of the proposed mine in 2011. Power Consulting, Inc. (Power) conducted an IMPLAN analysis of the effects of the mine focused on Arizona's Copper Triangle area in 2013. Both of the prior analyses can be considered advocacy analyses. The EPC work was funded by Resolution Copper Mine (RCM) and used to promote the proposed mine. The Power work was funded by the San Carlos Apache Tribe and used to critique the proposed mine. BBC's analysis provides an updated, independent third-party assessment.

In addition to the projected regional (and sub-regional) economic effects estimated using the IMPLAN model, this report also provides analysis and estimates regarding the geographic distribution of the workforce, the projected state and local fiscal impacts from the proposed mine, the potential vulnerability of the mine to operational cut backs or shut downs due to economic considerations, the potential impacts to local tourism and recreation economies, the potential impacts to amenity-based migration, and the potential impacts to property values. BBC's results and evaluations are compared to the previous socioeconomic studies identified above.

Study Area and IMPLAN Model Design

Study Area(s). For the purposes of the EIS, we are interested in quantifying and assessing effects at various geographic levels. Working outward from the location of the proposed mine, these include:

1. **Effects within the Town of Superior.** Given the limitations of IMPLAN geography, the best approximation of the mine's potential effects on employment, earnings and other economic metrics for jobs located within Superior are the projected effects within the ZIP code(s) that encompass Superior.

A couple of items to note here. First, in contrast to the results reported in the Power study, all (or virtually all) of the direct RCM jobs will be located in or near Superior. Direct effects in IMPLAN, like other employment-based economic data, reflect the

location where the jobs are based – not where the workers live. RCM’s answers to our questions confirmed they have no plans for satellite operations in Phoenix or elsewhere. Where the workers would actually live is a separate issue, and is analyzed accordingly later in this report.

2. **Effects within the Copper Triangle.** The “Copper Triangle” is an unofficial term for the area, primarily within Pinal and Gila counties, which contains historic copper mining communities, including Superior, Globe, Miami and others. In the Power report, this area was defined to include nine ZIP codes, as follows:

- Superior: 85173 and 85273
- Globe: 85501 and 85502
- Miami: 85539
- Kearney: 85137
- Winkelman and Dudleyville: 85192
- Hayden: 85135, and
- San Carlos: 85550

BBC reviewed more recent maps of the ZIP code areas and the ZIP code data available from IMPLAN and made a couple of changes to the Power list.

We added the following ZIP codes to fully capture the “Copper Triangle” and the region most likely to be affected by the proposed mine:

- Queen Valley: 85118
- San Carlos communities east of San Carlos: 85542

We eliminated the following ZIP code which no longer appears to exist¹:

- Superior: 85273

3. **Broader study area.** Based on RCM’s responses to our questions and other information, the vast majority of economic effects within Arizona are likely to take place within a five-county study area that includes Pinal County, Gila County, Maricopa County, Pima County and Graham County. Pima County was included because RCM indicated they have major suppliers located in the Tucson area, as well as the Phoenix area (RCM

¹ 85273 could not be found on a map of current zip codes in the area and does not exist in the 2016 IMPLAN zip code data files for Pinal County.

September 2017). Graham County is included because portions of the San Carlos Apache Tribe are located within that county.

Modeling design. Due to limitations in ZIP code level data and the IMPLAN modeling system, assessing impacts at these varied levels of geography required the development and use of multiple IMPLAN models.

- **County-based model.** Effects across the broader study area were assessed using a county-based model. Direct effects will occur in Pinal County. The Pinal County model was linked to models for Gila County, Maricopa County, Pima County and Graham County using IMPLAN’s multi-regional input-output (MRIO) analysis capability. This allowed BBC to estimate trade flows between these counties. Aggregate results for the broader study area were obtained by exporting the results from each county’s model and summing them in Excel.
- **ZIP-code based model.** Estimating more localized economic effects required the development and use of two models based on ZIP code level geography. The MRIO capability of estimating trade flows between different areas is not available at the ZIP code level, due to limitations on ZIP code level data and the corresponding inability to estimate trade flows between ZIP codes. However, IMPLAN does recommend a strategy for creating approximate MRIO analysis to estimate trade flows between areas using ZIP code data. BBC employed that strategy as follows:
 - We initially created a model for Superior alone, using the ZIP code that encompasses the town, and ran an impact analysis for that geography
 - We then created a model that also included the other ZIP codes within the Copper Triangle, and ran the same impact analysis on that geography
 - By subtracting the results from the first run from the results from the second run, we estimated the impacts on the remainder of the Copper Triangle (net of Superior)
 - By comparing the results from the second run to the results for Pinal and Gila counties from the county-based model, we estimated the approximate effects in the non-copper triangle portions of those two counties.

Direct Effects

In economic impact analysis, the term “direct effects” refers to output, employment, labor income and other economic metrics directly attributable to the proposed activity. In this case, direct effects refers to the output from the proposed mine, the workers and contractors who would be directly employed by the proposed mine, and the expenditures the mine would make to purchase goods and services.

As the proposed mine’s employees spend their earnings on household goods and services, they would create “induced” economic effects in other sectors of the economy. Similarly, suppliers of

goods and services to the mine would themselves purchase goods and services from their own suppliers that would produce additional economic effects. These effects are referred to as “indirect” economic effects. Together, indirect and induced economic effects are sometimes referred to as “secondary” or “multiplier” effects.

Approach. BBC conducted the analyses by modeling the effects as a change in copper production or employment for the copper industry sector (IMPLAN 27 in 536 sector model; NAICS 212234). We modified the copper mining production function to more closely approximate the operations of the proposed Resolution Mine based on the employment, payroll and expenditure data that RCM provided.

Personnel costs. RCM provided the following information to us:

- The average salary for RCM employees will be \$75,000 (RCM September 2017).
- This figure included benefits, at a “burden rate” of 35% (RCM October 2017).
- Figures in Attachment 1 were provided to EPC for their analysis in 2011 and were brought up to 2017 dollars to account for inflation (approximately 8.5% since 2011 per BLS).
- Salaries and personnel costs provided to EPC did not include employer tax costs. These would be an additional 8 percent. (Response to follow-up socioeconomic data inquiry, October 2017).

Based on the data RCM originally provided to EPC, the projected mine development schedule shown in the GPO (RCM 2016) and the clarifying information summarized above, BBC developed an updated vector of employment and personnel costs over the projected life of the mine (Figure I-1).

Expenditures on goods and services. RCM provided information on their anticipated personnel costs by year. They also provided information on their total anticipated expenditures by year, so BBC derived RCM’s projected purchases of goods and services as:

Expenditures on goods and services = Projected total expenditures minus Total personnel costs (fully burdened)

Figure I-1 depicts the updated profile of employment and goods and services purchases for the proposed mine. Key dates that may be worth focusing on for our analysis include:

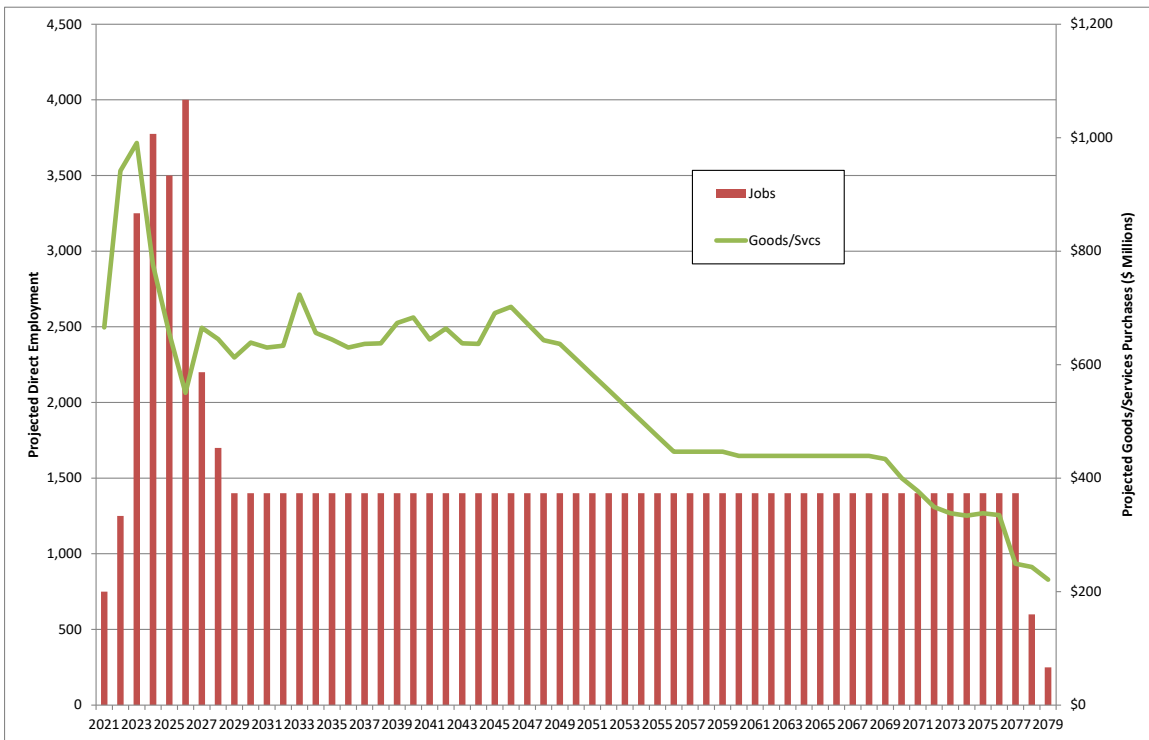
- 2023 which is projected to be the peak year for goods and services purchases (\$990 million in \$2017) as construction ramps up.
- 2026 which is projected to be the peak year for employment (4,000 jobs) as operations ramp up and construction is still near its peak.

- 2029 which is the first year of “steady state” operations, with employment at about 1,400 jobs and goods and services purchases of about \$613 million per year.

For purposes of this initial IMPLAN analysis, BBC modeled effects based on the average annual activity level for the proposed mine over the 2021-2079 period. Those annual averages are:

- 1,523 direct jobs (construction and operations)
- \$134 million per year in employee compensation
- \$546 million per year in goods and services purchases

Figure I-1. Projected Annual Employment and Goods and Services Purchases over the Life of the Proposed Resolution Mine



Source: BBC Research & Consulting based on data provided by Resolution Copper Mine, 2017.

Adjustments to IMPLAN copper mining industry profile to approximate proposed Resolution Mine. The IMPLAN models have a baseline industry profile for the copper mining industry from national input-output information, customized based upon regional data.

Figure I-2 depicts the baseline industry profile for the copper mining sector (IMPLAN 27) from the regional, county-based model which includes Pinal, Gila, Maricopa, Pima and Graham counties. Most of the regional values per worker (including employee compensation and other components of value-added, as well as intermediate purchases) are very similar to national averages for copper mining.

Figure I-2. Default IMPLAN Annual Copper Mining Industry Profile for Five-County Region

Industry Employment	4,899		
Industry Economic Metrics	Total	Per Worker	National per Worker
Output	\$2,311,218,000	\$471,764	\$470,910
<u>Value Added</u>			
Employee Compensation	\$438,276,400	\$89,461	\$91,368
Proprietor Income	\$27,253,430	\$5,563	\$2,827
Other Property Type Income	\$768,513,400	\$156,868	\$150,731
Tax on Production & Imports	\$100,785,600	\$20,572	\$26,684
Total Value Added	\$1,334,828,830	\$272,464	\$271,610
Intermediate Purchases	\$976,389,170	\$199,300	\$199,300

Source: IMPLAN 2016 (5 county model based on 2016 data files).

Given the unusual proposed mining methods for the Resolution Mine, it is not surprising that the economic profile of the proposed mine differs from IMPLAN’s default profile for copper mining in the region. The data provided by Resolution (summarized in Figure I-1) indicate a similar level of employee compensation per worker, but substantially larger purchases of goods and services (intermediate purchases) per worker than the regional industry average. These differences imply that the Resolution Mine would be less labor intensive, but more capital intensive, than more typical copper mining operations – which appears to be consistent with expectations concerning the mining methods anticipated for the proposed mine.

To better reflect the expected economic characteristics of the proposed mine, BBC made a slight adjustment to employee compensation per worker based on the information provided by Resolution. We made a much larger adjustment (increase) to the output per worker in order to approximate the anticipated output of the proposed mine of approximately 39 billion pounds of copper over the 59-year projected life of the mine (including construction and post-production closure and reclamation years) and make the purchases of goods and services (intermediate purchases) correspond to Resolution’s projections.

Figure I-3 depicts the customized industry profile specific to the proposed Resolution Mine. Total employment, expenditures for labor (employee compensation) and expenditures for goods and services (intermediate purchases) closely correspond to the annual averages over the life of the mine based on data provided by RCM. The total value of production (output) is consistent

with projected output from the mine provided by SWCA at a conservative projected copper price of \$2 per pound (SWCA 2018).² The other components of value added (proprietor income, other property type income, and taxes) were estimated by BBC based on data provided by RCM (taxes) and to balance the sum of value added and intermediate purchases to the projected annual mine output. Given RCM's ownership, BBC assumed that none of the value-added from the mine would compensate self-employed proprietors (proprietor income), with all profits instead flowing to corporate owners (other property type income).

Figure I-3. Customized IMPLAN Annual Copper Mining Industry Profile for Proposed Resolution Mine

Mine Employment	1,523		
	Total	Per Worker	National per Worker
Output	\$1,322,033,898	\$868,046	\$470,910
<u>Value Added</u>			
Employee Compensation	\$133,873,528	\$87,901	\$91,368
Proprietor Income	\$0	\$0	\$2,827
Other Property Type Income	\$564,339,666	\$370,545	\$150,731
Tax on Production & Imports	\$77,898,305	\$51,148	\$26,684
Total Value Added	\$776,111,498	\$509,594	\$271,610
Intermediate Purchases	\$545,922,400	\$358,452	\$199,300

Source: BBC Research & Consulting based on data provided by Resolution Copper Corporation, 2017 and MPLAN 2016 (5 county model based on 2016 data files).

Apart from the relatively low labor intensity and high capital intensity of the proposed mine, the customized profile summarized in Figure I-3 is also noteworthy in regard to the large share of value added attributed to “other property type income” or profit. Based upon the data provided by RCM in terms of projected costs for labor and intermediate purchases, as well as projected production, the proposed mine would appear to be more profitable than a typical copper mining operation in Arizona. BBC estimates that “other property type income” would account for about 42 percent of the total value of production for the proposed Resolution Mine. As shown in the previous baseline profile of the copper industry in southern Arizona (Figure I-2), the

² Projected copper production from the mine is described in more detail in the section of this memorandum entitled “Vulnerability to ‘Boom-Bust’ Cycles.”

combination of “proprietor income” and “other property type income” accounts for about 34 percent of the total value of production of more conventional copper mines.

While the high profit rate implies that a large share of the economic benefits of the mine would go to corporate headquarters and company shareholders, it also provides support for RCM’s statements that the proposed mine would be less susceptible to shutdowns or closure than conventional copper mines due to adverse changes in copper prices.

IMPLAN Modeling Results

Figure I-4 summarizes the results from BBC’s IMPLAN analysis of the proposed mine based on projected annual average employment and purchases of goods and services over the life of the mine. The IMPLAN results indicate that the proposed mine would create substantial “multiplier” effects in Arizona, supporting almost 2,200 indirect and induced jobs and about \$135 million per year in indirect and induced labor income.

Figure I-4 also indicates that most of the “multiplier” effects would occur outside of the “Copper Triangle.” While all of the direct mine employment is expected to occur in the ZIP code encompassing Superior, only 11 percent of the “multiplier” effects are projected to occur within that ZIP code. An additional 9 percent of the “multiplier” effects are projected to occur within other portions of the “Copper Triangle” as defined based on the 10 ZIP codes identified on page 2 of this report. About 80 percent of the “multiplier” effects are projected to occur outside of the “Copper Triangle.” The majority of “multiplier” effects would likely occur in Maricopa County, which is projected to receive about 68 percent of the indirect and induced economic benefits from the proposed mine based on BBC’s IMPLAN analysis³.

The geographic distribution of the projected “multiplier” effects from the proposed mine is not surprising given the location of the proposed mine. Superior and the other communities within the “Copper Triangle” are relatively small, but are located within relatively short commuting and transport distances from the Phoenix Metropolitan Area in Maricopa County.

³ To summarize the results shown in Figure 4, BBC reconciled the results from the zip code-based models focused on Superior and the Copper Triangle with the county-based MRIO models. The results from the county-based MRIO modeling alone indicate that Maricopa County could receive up to 81 percent of the “multiplier” effects, with multiplier effects in Pinal and Gila Counties representing about 13 percent of the total.

Figure I-4. Summary of IMPLAN Results based on Projected Average Annual Activity from Proposed Resolution Mine

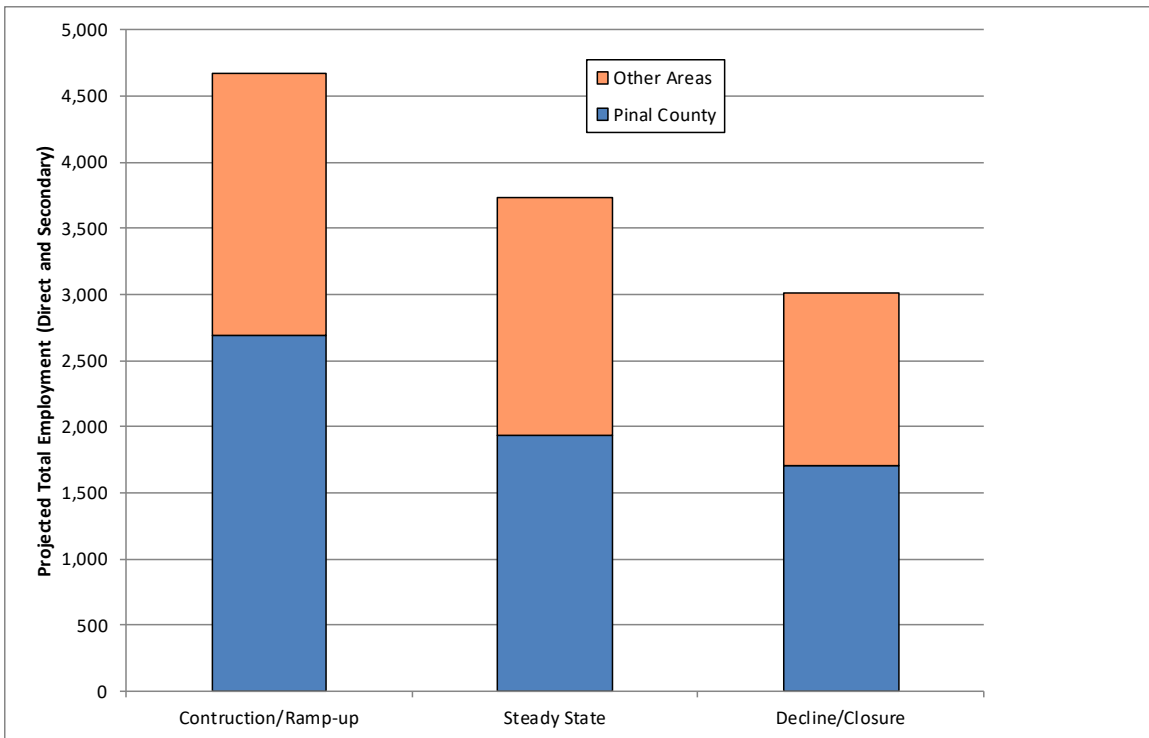
Geographic Area	Employment	Labor Income	Total Value Added	Output	Shares of "Multiplier" Effects*
Superior (Zip Code 85173)					
Direct Effect	1,523	\$133,873,199	\$776,111,650	\$1,322,033,898	
Indirect Effect	121	\$7,222,045	\$10,381,470	\$20,269,685	
Induced Effect	<u>177</u>	<u>\$4,425,516</u>	<u>\$15,176,135</u>	<u>\$26,033,219</u>	
Total Effect	1,820	\$145,520,760	\$801,669,255	\$1,368,336,802	11%
Rest of Copper Triangle					
(Indirect and Induced Effects Only)					
Other Pinal County Areas	98	\$1,045,321	\$1,723,133	\$10,551,992	3%
Gila County Areas	171	\$5,569,895	\$12,017,589	\$28,701,870	6%
Graham County Areas	<u>0</u>	<u>\$0</u>	<u>\$0</u>	<u>\$0</u>	<u>0%</u>
Total Rest of Copper Triangle	269	\$6,615,216	\$13,740,722	\$39,253,862	9%
Effects Outside of Copper Triangle					
(Indirect and Induced Effects Only)					
Pinal County (Remainder)	128	6,858,380	9,499,640	13,327,760	5%
Gila County (Remainder)	0	\$0	\$0	\$0	0%
Graham County (Remainder)	0	\$0	\$0	\$0	0%
Maricopa County	1,336	\$101,273,756	\$159,542,265	\$276,276,363	68%
Pima County	<u>149</u>	<u>\$8,538,230</u>	<u>\$16,491,137</u>	<u>\$36,609,281</u>	<u>7%</u>
	1,613	\$116,670,366	\$185,533,042	\$326,213,404	80%
Total Regional Effects					
Direct Effect	1,523	\$133,864,394	\$776,101,722	\$1,322,034,000	
Indirect Effect	1,175	\$93,446,967	\$145,179,020	\$273,403,409	
Induced Effect	<u>1,004</u>	<u>\$41,494,980</u>	<u>\$79,662,275</u>	<u>\$138,366,658</u>	
Total Effect	3,702	\$268,806,341	\$1,000,943,018	\$1,733,804,068	100%

Note: *Multiplier effects include indirect and induced effects. Percentages based on average of shares of indirect and induced employment and indirect and induced labor income. Totals may not sum precisely due to rounding.

Projected regional economic effects by phase of activity. As shown in Figure I-1, projected employment and procurement activity associated with the proposed mine is anticipated to vary over the life of the project. The largest direct employment at the proposed mine is projected to occur during the approximately 15-year period encompassing mine construction and the ramp-up to full production (potentially 2021-2035). The smallest direct employment levels, and the lowest spending on goods and services, are projected to occur during the latter years of production and the closure and reclamation period (potentially 2056-2079).

Figure I-5 depicts projected total regional employment supported by the mine during these three different phases of activity. All direct jobs at the mine are anticipated to be based near Superior, in Pinal County. All of the projected jobs outside of Pinal County, and a portion of the projected jobs in Pinal County, reflect the projected multiplier effects from expenditures of mine workers and the mine’s expenditures on goods and services within the region. Total regional employment effects are projected to vary from more than 4,600 regional jobs (on average) during construction and the ramp-up to full projection to just over 3,000 regional jobs (on average) during the declining years of production and the closure of the facility. About 3,700 regional jobs are estimated during the projected 20-year period of steady state production.

Figure I-5. Comparison of Projected Total Employment Effects During Different Phases of the Proposed Resolution Mine



Employee Residence Locations

Where the employees of the proposed mine would live was a topic of some dispute within the two prior socioeconomic effects analyses. Where the employees would live is critical from the standpoint of assessing effects on Superior and the Copper Triangle area in terms of demographics, demands for public services and other social and economic effects.

The remainder of this section describes the information available to assess potential employee residence patterns and provides preliminary assumptions about where employees may choose to live. Combining those assumptions with the direct and secondary employment projections described earlier in this report provides estimates of the potential demand for worker housing by location. The extent to which that demand can be met by the available housing stock in Superior and the Copper Triangle is discussed later in this section.

Potential to hire from existing workforce. RCM had EPC assess the existing workforce in the region. That assessment is somewhat general in nature, in that it does not define the number of workers RCM will need by occupation or provide specific employability requirements.

Resolution indicated that the proportion of jobs requiring a bachelor's degree is expected to be somewhere between 33% (share of present workforce) and 15% ("conservative estimate"). Nearly all jobs will require at least a high school diploma or GED. Resolution also indicated that the top 15 mining occupations identified in the EPC workforce assessment are applicable to the proposed RCM mine (RCM October 2017).

Based on the available information regarding the educational requirements and occupational mix needed for the proposed mine, there would appear to be the potential to fill some of the positions from the existing workforce in the area. The EPC workforce evaluation indicates that Gila and Pinal Counties have a relatively large number of workers in mining, construction and manufacturing industries compared to the state as a whole. The absolute numbers may be a bit misleading, however, since Pinal is a large county and portions of the county are considerably more remote from the proposed mine than the eastern Phoenix suburbs. It is also worth noting that hiring currently employed mining employees from the region may just move the demand for new employees from the RCM mine to the mines those workers have left.

Current residence choices of RCM employees. Data provided by RCM in response to the initial set of socioeconomic questions provides information regarding the residence of existing RCM employees. From 2010 through 2016, RCM has employed an average of about 190 workers.⁴ Approximately one-third of those workers appear to live in the Copper Triangle area (24% in Pinal County, 9% in Gila County), while approximately two-thirds live elsewhere in Arizona (likely predominantly in the eastern Phoenix suburbs).

County-to-county commuting flows. Another potentially useful indicator is the county-to-county worker flows data provided by the Census Bureau. These data could be a bit misleading

⁴ BBC estimate based on RCM payroll expenditures.

for Pinal County because of the geographic size of the county and the fact that the largest population and employment centers in the county are in the Casa Grande area, far from the Copper Triangle. The Gila County data may be a better indicator, though the potential to commute from the Phoenix area to Superior is likely greater than the potential to commute to the Gila County communities.

Figure I-5 summarizes the county-to-county commuting flows of Arizona workers to jobs in Pinal County and Gila County from the 2009-2013 5-year American Community Survey. These data indicate that about 80 percent of the jobs in Pinal County were filled by Pinal County residents during the five-year period. About 1/6 of these jobs were filled by commuters from Maricopa County. About 85 percent of the jobs in Gila County were filled by Gila County residents. Just under 6 percent were filled by residents from Maricopa County (U.S. Census Bureau 2017a.)

Figure I-5. Commuting Flows to Pinal and Gila Counties, 2009-2013

Source:
2009-2013 American Community Survey 5-year estimates..

Workers/Residences	Number	Share
Pinal County Workers		
<u>Place of Residence</u>		
Pinal County	64,496	80.5%
Maricopa County	13,346	16.7%
Pima County	1,754	2.2%
Remainder of AZ	479	0.6%
Gila County Workers		
<u>Place of Residence</u>		
Gila County	15,737	84.7%
Maricopa County	1,089	5.9%
Graham County	726	3.9%
Pinal County	610	3.3%
Pima County	107	0.6%
Coconino County	96	0.5%
Yavapai County	96	0.5%
Remainder	109	0.6%

The EPC workforce report also examined the commuting issue, using a different Census data source – the Longitudinal-Employer Household Dynamics Program (LEHD). BBC used the same source, which allows the user to define geographic areas on an interactive map, to examine commuting patterns specific to the Copper Triangle region.

Based on LEHD data, an average of 59 percent of the approximately 7,500 jobs in the Copper Triangle area were filled by residents from outside the region during the 2011-2016 period. The proportion of the approximately 2,400 “goods producing” jobs filled by commuters from outside

the region was slightly higher, averaging 62% over this same timeframe, as shown in the Figure I-6 (U.S. Census Bureau, 2017b).⁵

The LEHD data for the Copper Triangle area indicate much greater commuting into that area than the county-to-county data shown in Figure I-5. This result is not surprising, however, given the proximity of the Copper Triangle area to the Phoenix Metropolitan Area.

**Figure I-6.
Commuting
Flows into the
Copper Triangle
2011-2015**

Source:
US Census Bureau
2017b.

Census LEHD Data for Copper Triangle Area -- All Jobs				
	<u>Residence of Workers</u>		<u>Proportions of Jobs Filled By</u>	
	In Area	Outside	Residents	Commuters
2011	2,718	3,490	44%	56%
2012	2,471	3,529	41%	59%
2013	2,572	3,474	43%	57%
2014	2,697	5,288	34%	66%
2015	2,939	3,277	47%	53%
Average	2,679	3,812	41%	59%

Census LEHD Data for Copper Triangle Area -- Goods Producing Jobs				
	<u>Residence of Workers</u>		<u>Proportions of Jobs Filled By</u>	
	In Area	Outside	Residents	Commuters
2011	851	1,033	45%	55%
2012	848	1,080	44%	56%
2013	790	1,076	42%	58%
2014	1,035	2,920	26%	74%
2015	999	1,181	46%	54%
Average	905	1,458	38%	62%

Recommended assumptions regarding worker residence choices. Based on the combination of the LEHD analysis and the actual residence patterns of RCM’s workers over the past five years, it is reasonable to assume that 30 to 40 percent of the future workforce of the mine would choose to reside in the Copper Triangle, while 60 to 70 percent of the workforce would choose to commute to jobs at the mine (primarily from Maricopa County). Based on the RCM actual workforce data, it also seems probable that approximately 25 percent of the workforce would seek to live in or near Superior, and about 10 percent would choose to live in or near other communities within the Copper Triangle.

Figure I-7 combines the foregoing assumptions regarding worker residence preferences with the projected direct and secondary employment estimates related to the mine summarized

⁵ Goods producing jobs are defined as jobs in natural resources and mining, construction and manufacturing.

previously in Figure I-4. The resulting potential residence locations are termed housing “demand”, since the availability of housing in Superior is an important consideration as well.

Figure I-7. Projected Housing Demand by Geographic Area related to Proposed Resolution Mine

Geographic Area	Place of Work				
	Employment Projections		Projected Housing Demand*		
	Direct Jobs	Secondary Jobs	Direct Workers	Secondary Workers	All Workers
Superior	1,523	297	381	74	455
Rest of Copper Triangle	0	269	152	124	276
Other Pinal County	0	128	0	102	102
Maricopa County	0	1,336	990	1,729	2,719
Pima County	0	149	0	149	149
Total	1,523	2,179	1,523	2,179	3,702

Note: *These numbers reflect potential housing demand, prior to consideration of available housing capacity and other potential constraints.

Totals may not sum precisely due to rounding.

Constraints in Superior. While the preceding analyses of potential economic effects and regional commuting patterns indicate the proposed mine would create substantial demand for housing in Superior, the actual number of mine-related employees that would live in the Town (at least over the first decade of mine construction and operations) is likely to be constrained by the size and condition of the available housing supply.

At present, there are approximately 1,480 housing units within the Town of Superior. About 1,100 of those units are occupied. Of the remaining 380 units that are currently unoccupied, 75 are considered dilapidated, though only about 10 are considered beyond the possibility of being refurbished (Pryor, May 2018). Setting aside the housing units currently considered dilapidated (whether potentially refurbishable or not), there are approximately 300 unoccupied but inhabitable housing units in the Town. These homes likely span a fairly wide range in terms of their current condition.

Other constraints in attracting new workers to live in the Town include limited local services, retail and entertainment. Currently, Superior is primarily attracting the mining “transient” population, largely consisting of unmarried skilled trades workers on 3-to-4-year shifts. This demographic is typically looking for housing in RV parks or apartment rental housing. (Pryor, 2018). Some interviewees in Superior also indicated that the quality of local schools is also an issue in attracting young families to live in the community.

The limited housing stock and the other challenges in attracting new residents are likely to limit the number of mine-related workers that actually move to Superior, at least in the near term. While more than 400 of the new workers projected to result from the proposed mine might prefer to live nearby, given current conditions in the Town, BBC anticipates it is more likely that these new workers would absorb about one-half of the available, non-dilapidated housing stock during the first decade of mine construction and operations. This implies about 150 new households would move to Superior in the relatively near term.

The Town of Superior is well aware of the challenges it faces, and is actively working to reduce these constraints. The Town is in the early stages of creating a “land bank” designed to repurpose commercial buildings, reduce the number of dilapidated buildings and create more developable space. The Town is also considering potential annexations to increase the land available for new development, and is receiving approximately at least three inquiries from developers, and about one new development application, per week (Pryor, May 2018). If the proposed mine is permitted and develops as planned, it appears likely that additional housing (and potentially additional retail, service and entertainment development) would occur as well and a larger number of mine-related workers would locate in the community during the projected 40-year period of mine operations.

Projected Fiscal Effects

Another important dimension of the socioeconomic effects analysis is the impact of the proposed mine on the demand, cost and available revenues for public services, particularly in Superior.

The following discussion begins with the state and local government revenues projected to result from the activities of the proposed mine. While the proposed mine would also produce revenues for the federal government, these revenues have not been quantified for this EIS.

As illustrated in Figure I-8, operation of the proposed mine would produce both direct revenues to state and local governments (paid by RCM) and secondary revenues for those governments (which would be paid by employees and vendors). While there are numerous minor government revenues that would be generated by operation of the proposed mine, BBC estimates that more than 95 percent of the revenues that would accrue to the State of Arizona and the most affected local governments (those within Pinal and Gila counties) would stem from six revenue sources – some of which would produce revenues for both the State government and local governments:

- RCM Property Taxes (property taxes on the mine itself – paid to Pinal County and other local taxing entities)
- RCM Severance Taxes (paid to the State of Arizona, with a portion shared to local governments based on population)
- RCM Corporate Income Taxes (paid to the State of Arizona, with a portion shared to cities based on population through Urban Revenue Sharing Fund)
- Transaction Privilege Taxes (sales taxes paid to local governments and the State of Arizona – with a portion of the State revenues shared to local governments based on population)
- Employee Income taxes (paid to the State of Arizona, with a portion shared to cities based on population through Urban Revenue Sharing Fund)
- Employee Property taxes (paid to the jurisdictions in which the employees would reside)

Figure I-8. Primary Sources of State and Local Government Revenues related to the Proposed Resolution Mine

Local Governments	State of Arizona
<u>Direct Revenue Sources (Paid by RCM)</u>	
RCM Property Tax	RCM Severance Tax
RCM Severance Tax (local distribution share)	(excluding local share)
RCM Corporate Income Tax (share via URSF)	RCM Corporate Income Tax (excluding funds shared via URSF)
<u>Secondary Revenue Sources (Paid by direct and secondary employees and vendors)</u>	
Transaction Privilege Tax (Sales Tax) (proceeds from City/County levies) (share of State TPT)	State Transaction Privilege Tax (excluding Local Govt. Distribution)
Employee Income Taxes (share via URSF)	Employee Income Taxes (excluding sharing via URSF)
Employee Property Taxes	

RCM property taxes. The largest single source of new government revenues from the proposed mine would be the property taxes that RCM would pay to Pinal County and other entities with property taxing authority over RCM’s landholdings.

RCM currently owns 63 parcels of land in and around Superior. While 33 of the 63 parcels are located within the Town of Superior, these smaller parcels total only 88 acres out of the 3,211 acres RCM currently owns in the area (about 3 percent). With the land exchange, which would add the 2,422-acre Oak Flat Parcel to RCM’s landholdings outside of Superior, the Town’s share of RCM’s lands would decline to about 1.6 percent of the total.

Mining company landholdings in Arizona are valued at the individual parcel level. The value of producing mines, based on the methodology on the next page, is allocated to the lands located over the orebody itself. Consequently, the valuation of RCM’s landholdings in Superior would be based on the current value for their specific type of use such as office space, warehouse space, etc. (Gibson, May 2018).

The larger portion of RCM’s landholdings, located outside of Superior, would be subject to a current combined mill levy of 13.8529 mills from Pinal County and other entities with taxing authority. The smaller and less valuable portion of RCM’s landholdings within Superior would

be subject to a combined mill levy of 20.9844 mills, including the 7.1315 mills currently levied by the Town of Superior (Pinal County 2018).

In Arizona, the assessed value of operating mines is established by the State Department of Revenue. The primary method for valuing such properties is based on the present value of the net income stream produced by the mine. The assessed value is then set at 18 percent of the estimated “market” value of the mining property (AZ JLBC 2016). Based on the customized mining profile reflecting the projected characteristics of the proposed mine, BBC estimates that the assessed value of the proposed mine at a copper price of \$2 per pound would average approximately \$2 billion over the full 59 years of mine construction, operations, closure and reclamation. The assessed value during the 40-year period of actual copper production would be greater, while the assessed value during the pre-production and post-production years would be lower. At a copper price of \$2.50 per pound (as used in the information provided by RCM to EPC in 2011 and to BBC in 2017), BBC projects the assessed value of the mine would average approximately \$3 billion over the full 59-year period of mine-related activity.

Based on the current local government mill levies (property tax rates) described above, BBC estimated the composite property tax bill for the proposed mine at a copper price of \$2.50 per pound would average about \$42 million per year. Annual property tax revenues during pre-production and post-production periods would be lower, while average annual property tax revenues during the projected 40-year production period would be greater. Assuming the same price for copper, RCM estimated their annual property tax bill would average about \$65 million per year.

Given that RCM has more knowledge of the potential profitability of their proposed mine, but BBC’s estimate is more “conservative”, BBC has used both estimates for purposes of this analysis. It is important to note, however, that local government property tax revenues would be sensitive to variation in the price of copper. BBC estimates that an average annual copper price of \$2 per pound (as opposed to \$2.50 per pound) would reduce property tax revenues by approximately 37 percent.

Figure I-9, later in this section, depicts the projected distribution of annual property tax revenues from the proposed mine. Based on current tax rates, Superior Unified School District #105 would receive the most revenue from property taxes at a projected \$19 to \$30 million per year. However, it is important to note that school funding in Arizona is equalized on a per student basis across the state’s school districts based on a foundation system initially established in 1980 (ATRA 2009). If the proposed mine develops and substantially increases the property tax base within the school district, the state’s school finance system would likely lead to either a reduction in the school district’s mill levy, a redistribution of the increase in the school district’s property tax revenues to help fund other districts in Arizona, or a combination of both. It is likely that the actual impact on funding for the Superior Unified School District would be more related to a potential increase in the number of students in the district (due to direct and secondary mine-related workers and families moving into the district) than to the increase in the property tax base within the district.

Pinal County is projected to receive \$12 to \$18 million per year if the mine develops (based on its current mill levy), while the Pinal County Junior College would receive \$8 to \$12 million per year.

Although BBC estimates the Town of Superior would receive an average of more than ten million dollars per year in property tax revenues if the mine orebody was located within the Town (and the Town did not revise its current mill levy), the Town expects to receive about \$200,000 per year in property tax revenues from RCM (Pryor, May 2018).

RCM severance taxes. The State of Arizona collects severance taxes on operating mines and distributes a portion of those revenues to local governments (cities and counties) based on their shares of the statewide population. The State currently levies a 2.5 percent severance tax on 50 percent of the difference between the mine's annual gross revenues and its annual operating costs. As was the case with property tax revenues, BBC's estimates of the total annual severance tax revenues from the proposed mine differ somewhat from the estimates provided by RCM. Based on the customized mining profile reflecting the projected average annual characteristics of the proposed mine, BBC estimates the mine would produce about \$660 million in cumulative severance tax revenues over its entire life, while RCM estimated \$777 million in cumulative severance taxes over the life of the mine. As in the property tax revenue analysis, BBC has chosen to report the implications from both severance tax estimates as a potential range of future revenues.

Severance taxes would produce substantial revenues for the State of Arizona, estimated to average between \$5.3 million per year and \$6.3 million per year (based on BBC and RCM estimates, again assuming an average price of \$2.50 per pound for copper). Annual severance tax revenues would be higher during the actual 40-year production period.

While the total amount of severance tax revenues distributed to local governments would also be substantial (averaging approximately \$5.9 to \$6.9 million per year), the State's distribution mechanism would result in most of those revenues being distributed to the larger population areas (such as Maricopa County, Pima County and the cities of Phoenix and Tucson). BBC estimates that the total distribution to the cities located in the "copper triangle" (including Superior) would be less than \$10,000 per year. Pinal, Gila and Graham county governments would receive more revenue from the severance tax distribution, at a project annual average of about \$265,000 to \$312,000 per year for the three counties combined.

RCM corporate income taxes. Data provided to EPC and BBC indicates that in 2011 RCM anticipated the proposed mine would pay approximately \$1.7 billion in corporate income taxes over its anticipated life. This figure would correspond to an annual average of about \$29 million. Since 2011, however, the State of Arizona has reduced the corporate income tax rate from 6.968 percent to 4.9 percent (as of 2017). Consequently, BBC has estimated RCM's annual corporate income tax over the life of the mine would now average about \$20 million per year.

A portion of corporate income tax revenues in Arizona are distributed to municipalities through the Urban Revenue Sharing Fund (URSF). This distribution is based on shares of the total

municipal population within the state. Consequently, the distribution of corporate income tax revenue to the Town of Superior would be modest, at about \$10,000 per year. Including Globe and Miami, total corporate income tax distributions to cities within the “copper triangle” would be a little less than \$45,000 per year.

Transaction privilege taxes. In addition to property taxes, the other primary source of local government revenues is sales taxes, which are termed transaction privilege taxes (TPT) in Arizona and are levied on the seller (though the tax is commonly passed through to purchasers). The State of Arizona also levies a state TPT on goods and services purchases at the rate of 5.6 percent. A portion of the state TPT is distributed to local governments (cities and counties) according to a population-based formula.

TPT may be levied against some of the purchases of goods and services by the proposed mine, though there are numerous exemptions from the tax.⁶ TPT would also be obtained from sales to employees of the proposed mine and employees whose jobs would be indirectly supported by the mine’s activities. In 2016, the state TPT averaged about \$1,700 per job in Arizona (AZ JLBC 2016 and BEA 2017). Including applicable local TPT in the jurisdictions where the direct and secondary workforce from the proposed mine is projected to reside, and adjusting for the higher average compensation of these workers, BBC has estimated that the state and local jurisdictions would collect an average of about \$2,500 in TPT per worker. For purposes of this analysis, we have assumed the geographic distribution of TPT collections would follow the projected residence distribution of the workforce (as shown in Figure I-7, but adjusted for the housing capacity constraints in Superior described previously). Composite state and local TPT rates in areas where the workforce is expected to reside range from a high of 10.0 percent in Superior to a low of 6.3 percent in Maricopa County.

In total, BBC estimates that TPT on sales resulting from the proposed mine would generate about \$9.2 million per year in revenues for state and local governments. The state would retain about \$6.2 million in TPT revenue, while local governments would receive the remaining \$3 million from locally levied TPT and the state distribution to cities and counties. Pinal County is projected to receive about \$155,000 in TPT revenue (including the county’s 1.1 percent TPT and the county’s share of the state distribution). Gila County and the cities of Globe and Miami are projected to receive about \$197,000 per year in TPT. The Town of Superior is projected to receive about \$125,000 per year in TPT revenue, primarily from the 3.3 percent city TPT.

Employee income taxes. Employees of the proposed mine, of its suppliers based in Arizona, and of the Arizona-based suppliers of goods and services to their households would also be subject to state income tax. Like the corporate income taxes on RCM described earlier, 15 percent of these state tax revenues are distributed to Arizona cities through the Urban Revenue Sharing Fund.

⁶ For example, the sale of chemicals, machinery and equipment used in mining is exempt from transaction privilege taxes (AZ JLBC 2016).

Based on state personal income tax collections and the total compensation paid to Arizona workers over the past three years, BBC estimates the effective personal income tax rate on direct and secondary employees supported by the proposed mine would be approximately 2.0 percent (AZ JLBC 2016, BEA 2017). Incorporating the projected total labor compensation of the direct and secondary workforce of the proposed mine (Figure I-4), annual Arizona personal income tax collections on the direct and secondary workforce are projected to be about \$5.4 million. The state would retain 85 percent of this revenue, with the remainder distributed across all of the cities in Arizona. Given their relatively small populations, cities in the “copper triangle” would receive relatively little of this revenue, totaling about \$12,000 in aggregate. Superior would likely receive less than \$3,000 per year in distributions of employee income taxes.

Employee property taxes. The final major source of government revenues related to the proposed mine would be the property taxes paid by employees to the jurisdictions in which they reside. Employees who own their own homes would pay these taxes directly, while employees who rent their homes would pay them indirectly through their rental payments to landlords.

Given the uncertainty regarding the specific jurisdictions in which the direct and indirect workforce of the proposed mine would reside, BBC has limited the employee property tax analysis to potential tax revenues within the Town of Superior. While BBC estimated that over 450 workers would like to live in Superior (as shown in Figure I-7), our previous analysis of the limited housing capacity in Superior and other issues suggests that employees directly and indirectly related to the mine would more likely absorb about 150 available housing units in Superior – at least during the early years of mine development and operations.

For purposes of this analysis, BBC assumed the direct workers (RCM employees) that reside in Superior would own their homes, while the secondary workers would rent their homes. The average assessed value of primary residential (owner occupied) homes in Superior in 2017 was about \$3,300, while the average assessed value of rental residences in Superior was about \$2,840 (AZDOR 2017). BBC applied these average assessed values, multiplied by the projected number of resident workers, to the current property tax mill levies in Superior to estimate the annual property tax revenues the Town (and other taxing entities) would receive from the resident workforce.

On average, property taxes on the portion of the mine’s direct and indirect workforce that is projected to live in Superior are estimated to produce about \$100,000 in total annual revenue across all of the entities that levy property taxes within Superior. The Town of Superior is projected to receive about \$35,000 of the employee property tax revenue. Other substantial beneficiaries from employee property taxes would include the Superior Unified School District #105 (\$31,000 per year), Pinal County (\$19,000 per year) and Pinal County Junior College (\$12,000 per year).

It is possible that additional workers directly or indirectly supported by the proposed mine may purchase homes that are currently occupied by other residents of Superior and the other nearby communities (who are already paying property taxes). However, the displacement of any existing residents by Resolution workers would only increase local property taxes if the

additional demand for housing lifts current residential property values (and property tax revenues) within the communities.

State and local government revenue summary. Combining estimated revenues from the six primary revenue sources just described, the proposed mine is projected to generate an average of between \$88 and \$113 million per year in state and local tax revenues, as shown in Figure I-9.

The State of Arizona would be the largest recipient of tax revenues from the proposed mine, with projected average receipts of about \$34 million per year. Pinal County and Pinal County Junior College would also receive large amounts of tax revenues (ranging from about \$12 million to over \$30 million), primarily from property tax revenues on the proposed mine. While the Superior Unified School District would receive the largest amount of property tax revenue based on its current mill levy, the Arizona school finance equalization system would likely require the District to either reduce its mill levy, would distribute the additional tax revenues across other districts, or a combination of both. Although the Town of Superior is by far the closest municipality to the proposed mine, the Town is projected to receive a relatively small share of the total tax revenues (less than \$0.4 million per year.)

Figure I-9. Projected Average Annual State and Local Government Revenues related to the Proposed Resolution Mine

Location	Direct Revenues from RCM				Corporate Income Tax	Taxes on Employees*			Totals by Jurisdiction	
	Property Tax		Severance Tax			Transaction Privilege Tax	Personal Income Tax	Employee Property Tax***	Low Est.	High Est.
	BBC est.	RCC est.	BBC est.	RCC est.						
Town of Superior	\$200,000	\$200,000	\$993	\$1,169	\$10,226	\$124,056	\$2,688	\$34,565	\$372,529	\$372,705
Superior School Dist.****	\$19,238,311	\$30,056,705	\$0	\$0	\$0	\$0	\$0	\$31,177	\$19,238,311	\$30,087,882
Pinal County Jr. College	\$7,605,420	\$11,882,220	\$0	\$0	\$0	\$0	\$0	\$12,325	\$7,605,420	\$11,894,545
Pinal County	\$11,574,271	\$18,082,899	\$213,106	\$250,903	\$0	\$154,597	\$0	\$18,757	\$11,941,974	\$18,507,156
Gila County	\$0	\$0	\$30,363	\$35,748	\$0	\$66,910	\$0	NA	\$97,273	\$102,658
Graham County	\$0	\$0	\$21,108	\$24,852	\$0	\$5,629	\$0	NA	\$26,737	\$30,481
Other AZ Jurisdictions**	\$3,013,874	\$4,708,684	\$5,596,580	\$6,589,195	\$3,057,697	\$2,576,845	\$791,903	NA	\$15,036,899	\$17,724,324
State of Arizona	<u>\$0</u>	<u>\$0</u>	<u>\$5,323,452</u>	<u>\$6,267,624</u>	<u>\$17,384,898</u>	<u>\$6,242,168</u>	<u>\$4,569,708</u>	<u>NA</u>	<u>\$33,520,225</u>	<u>\$34,464,398</u>
Totals	\$41,631,876	\$64,930,508	\$11,185,602	\$13,169,492	\$20,452,821	\$9,170,204	\$5,364,299	NA	\$87,839,367	\$113,184,149

Note: * Includes direct, indirect and induced employment from proposed mine.

** Includes all Arizona municipalities other than Superior; all Arizona counties other than Pinal, Gila and Graham; and all property taxing entities in Pinal County other than those identified in table.

*** Property taxes on homes of projected employees only estimated for potential Superior residents due to uncertainty regarding specific residence locations for other workers outside of Superior.

****School district revenues based on current mill levy. Arizona school finance equalization formula would likely result in either a reduction in the mill levy, a redistribution of revenues to other districts, or both.

Totals may not sum precisely due to rounding.

Mine-related Demands and Costs for Public Services. Development and operations of the proposed mine would generate additional demands for public services, and additional costs to provide such services. Based on the location of the proposed mine in Pinal County, just outside the municipal boundaries of the Town of Superior, those two jurisdictions and the Superior School District would be the most affected by additional service requirements and costs.

The Town of Superior anticipates that its costs of providing services related to public safety (police and fire protection) would increase by about 50 percent if and when the proposed mine becomes fully operational. Based on Superior's current expenditures to provide these services, this would represent an increase of about \$375,000 per year in costs for the Town. The proposed mine would also use the wastewater services provided by the Town, but these services are provided on an enterprise basis (based on volumetric billing rates) and any effects on the cost of wastewater services should be offset by corresponding revenues. The Town has more than enough capacity to provide the necessary wastewater collection and treatment services to the proposed mine. Construction and operations of the proposed mine could also affect Superior's costs to maintain its network of streets and roads, though this impact is more difficult to project. (Pryor 2018).

One approach to estimating the overall effects of the proposed mine on Superior's costs of providing local government services is to consider the impact of the mine on the Town's "service population." This approach, which is often used in developing forecasts of capacity requirements for a variety of public services, recognizes that residents are not the only group that requires municipal services. Employees (and visitors) in a community also require (and benefit from) emergency services, street maintenance and other public expenditures.

To estimate the overall service population for the Town of Superior if the proposed mine is developed, BBC has assumed that each mine employee will place approximately 1/3 of the demand on municipal services that a Town resident does. This "weight" reflects the fact that the mine's employees would spend about 1/3 of their overall time in or near Superior and is broadly consistent with other studies of municipal financial impacts using the "service population" concept, which often assign weights of between 0.2 and 0.5 to local employees served by municipal governments (EPS 2013).

Based on the service population approach, the Town of Superior currently provides public services to about 3,232 resident equivalents (REs), at an average cost of about \$550 per RE. If the proposed mine develops as planned. The resident equivalent service population of the Town is projected to increase to about 4,273 REs, including both mine-related employees projected to live in Superior and the large employment base working just outside of the Town. Maintaining the same level of service (costs per RE) as the Town currently provides, the total costs for Superior of providing general government services are projected to increase by about \$540,000 per year as shown in Figure I-10. This estimate of the proposed mine's impact on Superior's cost of providing municipal services is somewhat larger than the Town's projection of \$375,000 in additional costs for emergency services, but also reflects the additional demands the mine could place on street maintenance and general government activities for the Town. The projected increase in Superior's cost of providing municipal services if the mine is developed exceeds the projected increase in tax revenues for the Town shown previously in Figure I-9.

Figure I-10. Projected Effects of Mine on Town of Superior General Government Costs

Metrics	Current Conditions	Projected Conditions With Mine	Projected Mine Effect
Resident Population	2,999	3,389	
Employees*	707	2,527	
Employee Weight**	<u>0.33</u>	<u>0.33</u>	
Effective Service Population	3,232	4,223	991
Expenditures/Effective Service Population	\$550	\$550	
General Government Costs*** (in millions of dollars)	\$1.78	\$2.32	\$0.54

Notes: *Employees based within ZIP code encompassing Town of Superior.

**Approximate demand on Town services per local employee relative to a local resident.

***Excludes costs of self-funded enterprise funds such as wastewater services and ambulance services.

Sources: U.S. Census Bureau, 2017; IMPLAN, 2016; Town of Superior, 2016.

Pinal County would also provide services to the proposed mine, including road maintenance, additional public safety services and other county government activities. Relative to the scale of overall county government activities, the proposed mine is not likely to create a substantial burden for the County.

As shown earlier in Figure I-4, the proposed mine is projected to directly and indirectly support a little over 2,000 new jobs in Pinal County. This would represent about a two percent increase in overall county employment. The projected residence locations for the workforce, shown previously in Figure I-7, indicate that about 700 of those workers would likely reside in Pinal County. Based on the current average household size in Pinal County of about 2.8 residents, the total effect of the proposed mine on the County’s population would be an increase of about 1,800 residents. This would be an increase of about four percent based on the current county population of approximately 418,000 residents.

Based on these projected increases in Pinal County population and employment, and current Pinal County general government expenditures of about \$150 million per year, the proposed mine could increase the costs of county service provision by about \$3 to \$6 million per year. As shown in Figure I-9, the proposed mine is projected to increase Pinal County’s revenues by an annual average of between \$12 and \$19 million, which is likely to substantially exceed the increase in the costs of service provision for the county.

To the extent that employees directly or indirectly supported by the proposed mine choose to live in or near Superior and have school age children in their households, development and operation of the proposed mine would also increase the demand for K-12 education services and the cost for the Superior School District to provide those services. Given the nature of school funding in Arizona, which is based on school and district enrollment, these costs are likely to be

offset by additional revenues that would be provided through the Arizona school foundation system.

Schools in the Superior School District are currently operating well below their designed capacity. The elementary school in Superior currently has about 170 enrolled students, but has a capacity to educate about 350 students. The combined middle and high school currently have about 175 students, but have the capacity to educate up to 400 students (Estatico, May 2018).

SECTION II.

Vulnerability to Boom-Bust Cycles

SECTION II.

Vulnerability to Boom-Bust Cycles

Another socioeconomic concern that received considerable attention in the Power report was the potential for the proposed Resolution Mine to be subject to “boom-bust” cycles, primarily due to fluctuations in the price of copper. As described in the Power report, copper production in the U.S. (and copper employment and wages in Arizona) have historically been quite variable (Power 2013). Substantial cut backs, or complete suspensions, in mine operations can have considerable socioeconomic impacts on smaller communities that are highly dependent on mining employment and revenues.

BBC evaluated the potential vulnerability of the proposed Resolution Mine to potential cutbacks or suspensions in operations due to fluctuations in the price of copper. The unusual economic characteristics of the proposed mine are considered in this context.

Economic considerations. Standard microeconomic theory holds that firms should operate as long as their revenues exceed their variable costs — the costs they can control by changing the scale of their operations, such as payroll and operational purchases of goods and services. Even if the firm is operating at a loss relative to their total costs (including fixed costs like debt service), as long as their operational revenues can cover their variable costs and contribute anything towards the payment of their fixed costs, they are better off than if they shut down and have to pay all of their fixed costs while receiving no revenues from their operations (Krugman and Wells 2008).¹

Projected variable costs for Resolution. SWCA has developed estimates of the annual levels of copper production from the proposed mine over a 40 year production period (SWCA 2018). Based on those estimates, it is useful to think about the proposed mine in terms of three production phases:

- *Ramp up to full production.* During the first ten years of production, the annual copper output from the proposed mine is projected to average approximately 0.8 billion pounds of copper per year.
- *Full production.* During the following twenty years, annual copper output from the proposed mine is projected to average approximately 1.3 billion pounds of copper per year.
- *Declining production.* During the final ten years of production, annual copper output is projected to average about 0.5 billion pounds of copper per year.

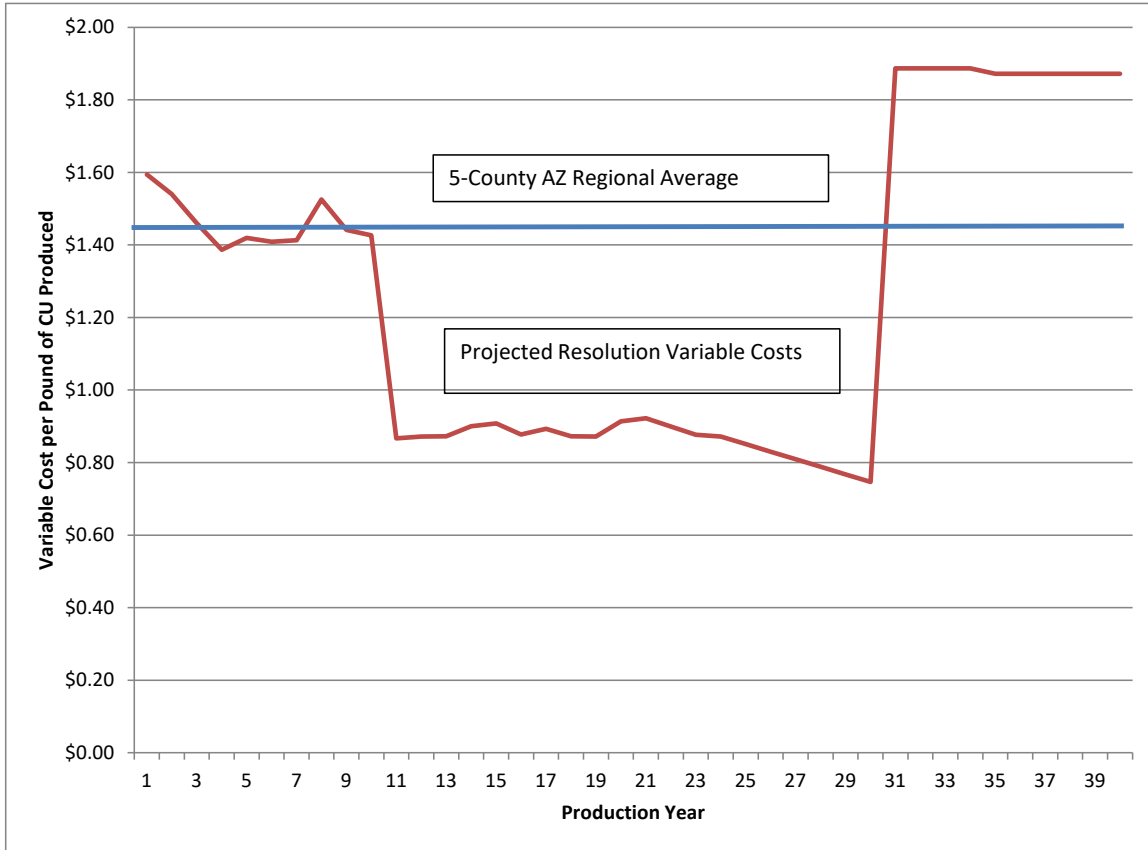
¹ Exceptions to this concept would situations where a firm could reduce or eliminate its fixed costs through bankruptcy or closing its operations and selling its assets.

By overlaying these projected production levels during each phase with the projected personnel costs and annual expenditures on goods and services provided by RCM (as depicted in Figure II-1) and the mine's projected annual tax costs, we can estimate the proposed mine's annual variable cost per pound of copper produced across the anticipated 40 years of production. Overall, the proposed mine's variable costs are estimated to average about \$1.27 per pound, but the variable costs per pound of production differ considerably among the three operational phases (as shown in Figure II-1). For purposes of comparison, Figure II-1 also depicts the average variable cost per pound of production for the existing mines in the 5-county region (\$1.45 per pound), based on the 2016 economic profile of the region's copper industry provided in Figure II-2.

As illustrated in Figure II-1, during the first ten year ramp up to full production, the variable costs of the proposed Resolution Mine are estimated to average around \$1.50 per pound, generally comparable to the average variable costs per pound for the existing copper mines in the region. During the twenty year period of full production, Resolution's variable costs are projected to drop to around \$0.90 per pound or less. During the final decade of production, the variable costs of the proposed mine are projected to increase to around \$1.90 per pound as production levels decline.

From a purely economic standpoint, the sustainability and consistency of operations at the proposed mine would depend on the level of copper prices in relation to these estimated variable costs.

Figure II-1. Projected Annual Variable Costs of the Proposed Resolution Mine per Pound of Copper Produced

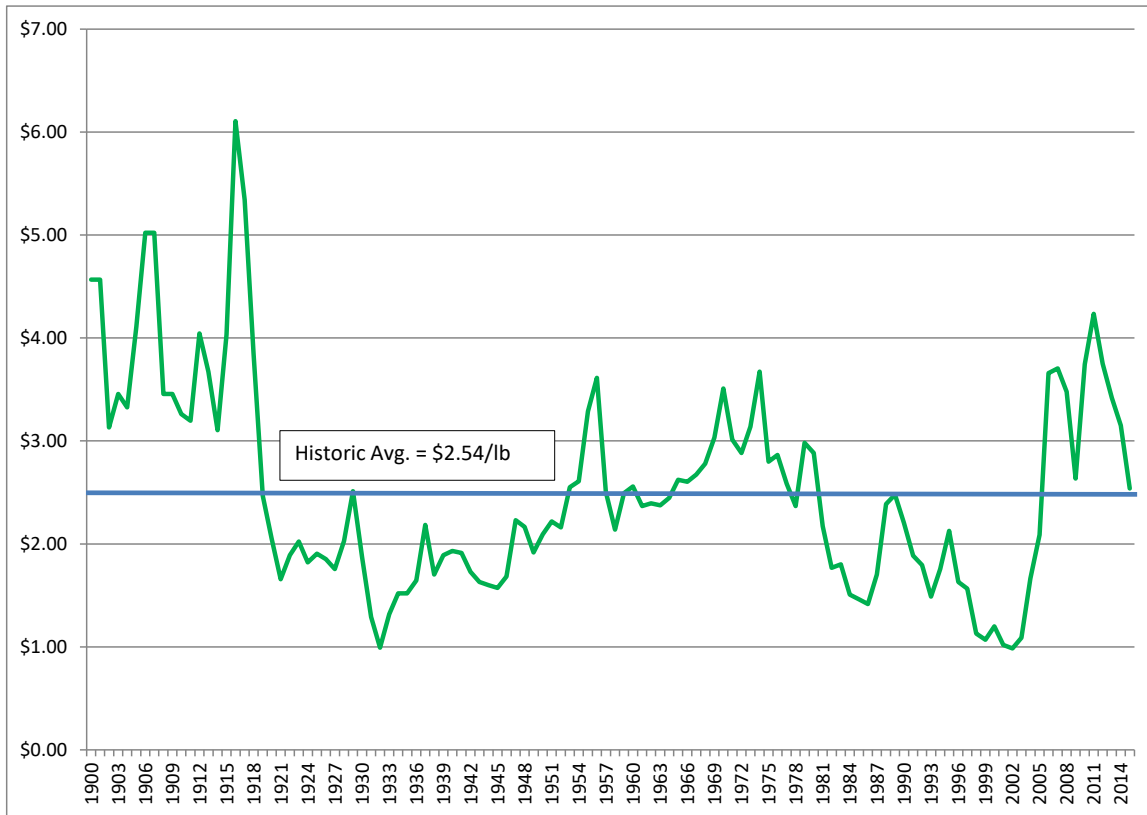


Source: BBC Research & Consulting based on data provided by Resolution Copper Corporation, 2017; BBC estimates of annual state and local tax costs; and EPC 2011 estimates of federal tax costs (updated for inflation).

Historical copper prices and price variability. Figure II-2 depicts historical copper prices from 1900 through 2015, expressed in terms of 2017 dollars (e.g. inflation adjusted). Over that 116 year period, the price of copper has averaged \$2.52 per pound, but varied from as much as \$6.11 per pound in 1916 to as little as \$0.98 per pound in 2002 (USGS 2017).

During the most recent 50 years shown in Figure II-2 (1966-2015), the average price of copper has been slightly lower, at \$2.39 per pound. The maximum price during this period was \$4.23 (in 2011). In 2016 and 2017 (not shown in chart), the price of copper in 2017 dollars averaged \$2.25 and \$2.61, respectively (Statista 2018).

Figure II-2. Historical Copper Price per Pound, 1900-2015



Source: BBC Research & Consulting based on data provided by Resolution Copper Corporation, 2017; BBC estimates of annual state and local tax costs; and EPC 2011 estimates of federal tax costs (updated for inflation).

Economic evaluation. From the standpoint of purely short-term economic considerations, the critical threshold where copper prices would fall below projected variable costs for the proposed mine during the first ten year ramp up to full production appears to be about \$1.50 per pound (as shown in Figure II-1). Over the past 116 years, copper prices have fallen below this level about 10 percent of the time. During the potentially more relevant period of the past 50 years, prices have fallen below this level about 18 percent of the time.

However, as RCM is undoubtedly well aware, the relatively expensive production during the ramp up period is a necessary step to reach the much more profitable period of full production. Based on the projected variable costs over time illustrated in Figure II-1, it seems relatively unlikely that the proposed mine would shut down during the ramp up period based on short-term economic considerations as long as the production and cost path is consistent with these projections.

During the following twenty years of full production, it appears likely that the proposed mine would have very low variable costs per pound of production relative to the more conventional mines in the region. Again considering just short-term economic considerations, the critical threshold price during this period would appear to be below \$1 per pound. Over either the full 116 year period of 1900-2015, or the more recent 50 year period from 1966-2015, the price of copper has only fallen below \$1 per pound about 2 percent of the time. Consequently, again from

a purely economic standpoint, it appears very unlikely that the proposed mine would shut down or substantially cut back its operations during this period – as long as production and costs are following their projected paths.

The proposed mine would, however, appear to be more vulnerable to slow downs or operational suspensions for economic reasons during the final ten years of production. Based on the variable cost projections shown in Figure II-1, the critical copper price threshold during this period appears to be around \$1.90 per pound. Over the past 115 years, copper prices have fallen below this level about 33 percent of the time. During the more recent last 50 years, prices have fallen below this level about 38 percent of the time.

Since 1966, there have been three sustained periods of prices below \$1.90 per pound, including the six year period from 1982-1987, the four year period from 1991-1994, and the nine year period from 1996-2004. Considering only short-term economic factors, there would appear to be a reasonable likelihood that the proposed mine could either scale back its operations or temporarily shut down at some point during the final ten years of production due to low copper prices.

Conclusions regarding potential for “boom-bust” cycles. The global price of copper has historically been highly variable. Periods of low and/or declining copper prices have contributed to fluctuations in copper mining employment and wages in Arizona, and those fluctuations have undoubtedly created economic and fiscal hardships in smaller communities that are heavily dependent on mining.

Presuming that RCM’s projections of operational employment, labor costs, non-labor operating costs and output prove reasonably accurate, the proposed Resolution Mine will have lower operating costs than the typical conventional copper mines in the region. It appears unlikely that the proposed mine would have to suspend or substantially cut back its operations for purely economic reasons during either the ten year ramp up period or the following twenty years of full production. During the last ten years of the mine’s anticipated production life, the operational economics of the mine appear less advantageous, and there appears to be a greater likelihood that operations could be reduced or suspended for economic reasons.

SECTION III.

Comparison to Previous Socioeconomic Studies

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Comparison to Previous Socioeconomic Studies

As noted at the outset of this TM, previous socioeconomic studies were conducted on behalf of Resolution Copper Corporation (EPC 2011) and on behalf of the San Carlos Apache Tribe in a critique of the proposed mine (Power 2013). Both of the two prior studies also used the IMPLAN modeling system. The following section compares and contrasts BBC's results with the two prior studies.

Elliott D. Pollack & Company, 2011 Study. The EPC study focused primarily on reporting cumulative projected economic and fiscal effects over the entire life of the proposed mine. BBC has not developed estimates of the potential cumulative effects over the next 50 or 60 years because annual economic effects provide much more useful information in the context of an EIS.

The EPC study does, however, summarize their estimates of the annual economic effects of the mine in Table 5 on page 7 of their report. Across the State of Arizona as a whole, EPC reports the following estimated, average annual effects:

- Direct employment 1,429 jobs
- Total employment 3,719 jobs
- Direct labor income \$107.2 million
- Total labor income \$220.5 million
- Direct output \$645.1 million
- Total output \$960.0 million

Comparison of the average annual statewide effects from the EPC report with the BBC's estimates of the average annual effects across the five county region (reported in Table 4 of this TM) indicates that BBC's regional economic effects estimates are pretty similar in terms of employment, higher in terms of labor income, and considerably higher in terms of economic output. We believe these differences stem to a small degree from updated data used by BBC and to a larger degree from a difference in modeling approach between the two studies.

Updated data in the BBC study. Both the EPC study and the BBC study started from the data that RCM provided to EPC in 2011. However, BBC updated the seven year old RCM data in the following ways:

- BBC excluded the first five years of projected employment and other expenditures that RCM provided to EPC in 2011. Those years are already in the past, and BBC was focused on modeling the potential economic effects of the proposed mine from this point forward. During those first five years, RCM averaged only 427 employees. The exclusion of those

years accounts for the difference in direct employment between the EPC estimates and the BBC estimates.

- BBC updated the total labor compensation figures from RCM to include inflation from 2011 to 2017 (approximately 8.5 percent) and to include employer tax costs (contributions for Social Security and Medicare). The latter makes the RCM personnel cost estimates consistent with the definition of labor income used in the IMPLAN model, and was not included in the workforce salary estimates provided in the 2011 data used by EPC (RCM response to Baseline Data Request #2 Follow Up Questions. October 20, 2017). The combination of the inflation adjustment, the inclusion of employer tax costs for employees, and the slightly higher direct employment estimate described in the previous bullet account for the differences between BBC's estimate of direct labor income and the EPC estimate in 2011.

Difference in modeling approach. The largest differences between the EPC estimates and the BBC estimates are in the considerably larger estimates of direct and total output in the BBC study than in the previous EPC study.

The EPC report does not provide much detail regarding their IMPLAN modeling, and there is no indication in the EPC report that they customized the default copper mining industry profile in the IMPLAN model to reflect the unique characteristics of the proposed Resolution mine. As described earlier in the TM, the information provided by RCM indicates that the proposed mine would be much less labor intensive (per unit of copper produced) than a typical copper mine. The differences are most apparent by comparing the default copper mining industry profile in the IMPLAN model shown in Figure I-2 with the customized profile for the proposed Resolution Mine that BBC developed based on the projected output, employment and purchases of goods and services provided by RCM (shown in Figure I-3).

For purposes of comparison to the EPC results, BBC examined the projected effects of the Resolution Mine using the default copper mining industry profile in the IMPLAN. Based on the projected direct employment of the mine (but using the default copper mining industry profile), we obtained output results that are more similar to the EPC results, as shown below:

- Direct output \$729 million
- Total output \$1.09 billion

The proposed mine, however, would use fundamentally different methods than a typical copper mining operation. One of the clearest indicators of the problems created by modeling the Resolution Mine based on its projected employment and the default profile of a typical copper mining operation is apparent in the EPC estimates of the direct output from the mine. As shown earlier, EPC estimated the direct output of the proposed mine at \$645 million in 2011. The EPC report also indicates they assumed a copper price of \$2.50 per pound, so this direct output estimate would correspond to production of approximately 258 million pounds of copper per year. While that level of production corresponds to the output of a conventional Arizona copper mine employing about 1,500 people, the proposed Resolution Mine is expected to produce an average of approximately 660 million pounds of copper per year over the full 59-year life of the

mine (nearly 1 billion pounds of copper per year during the 40-year production phase) with the same level of employment.

For purposes of further comparison, BBC also modeled the regional economic impacts of a conventional copper mine with the same level of production expected of the Resolution Mine (approximately 1 billion pounds of copper per year). A conventional mine with that level of production would directly employ about 4,200 workers and would produce total regional economic effects of over 10,000 jobs per year.

In sum, the proposed Resolution Copper Mine would be fundamentally different from traditional copper mines. Based on the data provided by RCM, the proposed mine would be much more productive and have low labor intensity and high capital intensity (relative to its level of production). To adequately assess the economic effects of the proposed mine, it is important to capture these distinctive aspects of the operation.

Fiscal revenue estimates. The EPC report also provides estimates of the benefits of the mine in terms of government revenues. Although EPC focused on quantifying government revenues over the entire life of the proposed mine, their estimates can be compared to BBC's estimates by dividing them by the assumed 59-year operational life of the facility.

EPC projected that state and local government entities would receive approximately \$5.78 billion in direct and secondary revenues over the life of the proposed mine (EPC 2011, Table B, page iii). This corresponds to annual revenues of approximately \$98 million. As shown in Figure I-9, BBC's estimate of average annual state and local revenues is between \$88 and \$113 million. However, the EPC revenue estimates exclude property taxes to school districts (for the reasons noted earlier regarding the school equalization mechanism in Arizona). Excluding the school district property tax revenues shown in Figure I-9, BBC's estimate of annual state and local tax revenues would be between \$69 and \$83 million per year, which is lower than the EPC estimates. The difference may be attributable to the inclusion of more minor revenue sources in the EPC report (such as the vehicle license tax, unemployment tax and HURF tax) and EPC's estimates of the total property taxes that would be paid by all direct and secondary workers related to the mine. As noted earlier, BBC only sought to quantify employee property taxes for the portion of the workforce expected to reside in Superior.

EPC did not provide an estimate of the distribution of local government tax revenues among individual counties and municipalities, instead reporting only aggregate totals for all municipalities and counties in Arizona.

Power Consulting, Inc., 2013 Study. The Power study did not dispute the total statewide economic effects estimates from the EPC study, although Power did critique the EPC focus on cumulative effects over the life of the mine. One of the primary arguments in the Power study, however, was that the local economic effects in Superior and other communities within the "Copper Triangle" would be much smaller than the statewide effects.

Using an approach similar to BBC's of estimating economic effects from the proposed mine within a local "copper triangle" region comprised of about 9 ZIP codes, Power concluded that "indirect and induced employment impacts within the local study area are only about a quarter

of the statewide impacts estimated in the Pollack Report. The induced impacts on labor income are only about a fifth of what the Pollack Report estimated.” (Power, 2013. Page 41).

While BBC disagrees with Power’s approach of counting only a portion of the direct employment effects within the local region surrounding the mine (as discussed on page 1 of this TM), the results from our local area economic effects modeling are consistent with Power’s observation regarding the distribution of indirect and induced economic effects (also termed “multiplier effects”) from the mine. As shown in Figure I-4 of this TM, BBC estimates that approximately 20% of the indirect and induced employment and earnings from the proposed Resolution Mine are likely to occur within the “Copper Triangle.”

In response to the fiscal estimates provided in the EPC report, Power raised concerns regarding the geographic distribution of the projected local governments (which was not provided in the EPC study). BBC’s analysis indicates that Power was correct in their view that relatively little of the local government revenues would flow to the Town of Superior (or other nearby municipalities in the “copper triangle”), though Pinal County would likely receive substantial property tax revenues from the proposed mine.

Power also raised concerns about the potential for the proposed mine (and the surrounding community) to be adversely affected by “boom-bust” cycles, primarily due to fluctuations in the global price of copper. While BBC agrees with Power that Arizona mines and mining communities have been substantially impacted by variability in the economics of mining, our analysis indicates that the proposed mine would be a low cost producer during much of its anticipated operational life. Prior to the final ten years of anticipated production, it appears unlikely the proposed mine would have to suspend or substantially cut back its operations for purely economic reasons. During the final ten years of production, the proposed mine could be more vulnerable to low copper prices.

Power also raised concerns about the need to evaluate the additional costs that local governments could face to serve the mine and its workforce. Those potential costs and effects have been evaluated and described in this TM.

SECTION IV.

Effects on Tourism and Recreation

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Effects on Tourism and Recreation

Introduction

The proposed Resolution Copper Mine could affect the tourism industries of Pinal and Gila counties, including the Town of Superior. Data on tourism statistics, including visitation numbers, visitor spending, and visitor activities, are often collected and reported at the county level. However, the 'Copper Triangle' area, which contains both counties and the Town of Superior, has been the focus of recent efforts to study and promote the area's tourism industry as a way to expand its economic base beyond mining. As a result, several surveys and other data on tourism are available for the Copper Triangle region. This report makes use of these data by discussing the proposed mine's effect on tourism in Pinal and Gila counties and the Copper Triangle region.

Current Tourism Economy

The tourism and recreation industry is a critical contributor to the economy of the state of Arizona. According to a 2017 report by Dean Runyan Associates, the travel industry is the top export-oriented industry in the state with a Gross Domestic Product of \$9.8 billion (Dean Runyan Associates 2017). In 2017, Arizona counties hosted 38.3 million overnight visitors, who spent a total of \$18.7 billion. These visitors supported 187,060 jobs and contributed \$1.95 billion in state and local tax revenue.

Of the 38 million travelers spending at least one night in Arizona in 2017, 32 million (84%) were leisure visitors and 6 million (16%) were business travelers. The percentage of travelers visiting Arizona for leisure has increased since 2010, when it was 80 percent. Top activities for leisure visitors in 2017 included shopping, visiting national or state parks, fine dining, visiting historic sites, and hiking or backpacking (Arizona Office of Tourism 2018). In 2017, there were 5.6 million recreational visitors to National Parks within Arizona and 1.7 million visitors to Arizona State Parks.

The tourism economy in Phoenix and central Arizona. In 2017, 22.7 million visitors traveled to the Phoenix & Central Arizona region, which includes Maricopa and Pinal Counties. Figure IV-1 displays 2017 visitation data and visitor profiles by region across the state of Arizona.

Figure IV-1.
2017 Arizona Overnight Visitors by Region

	Total Arizona Overnight Visitors	North Central Overnight Visitors	Northern Overnight Visitors	Phoenix & Central Overnight Visitors	Tucson & Southern Overnight Visitors	West Coast Overnight Visitors
Visitors	38.3 million	5.9 million	7.8 million	22.7 million	6.5 million	6.1 million
Leisure/Business Visitors	84%/16%	92%/8%	95%/5%	84%/16%	88%/12%	90%/10%
Non-resident/Resident Visitors	72%/28%	66%/34%	63%/37%	79%/21%	65%/35%	82%/18%
Average Length of Stay	3.6 nights	3.7 nights	3.1 nights	4.5 nights	4.2 nights	3.2 nights
Average Travel Party Size	2.8 persons	3.0 persons	3.1 persons	2.7 persons	2.5 persons	3.1 persons
Average Age	45 years	44.1 years	42.8 years	47.3 years	50 years	39 years
Trip Expenditures per Party	\$645	\$719	\$664	\$561	\$698	\$582
Top Activities	Shopping; National/State Park; Fine Dining; Landmark/Historic Site	Shopping; National/State Park; Hiking/Backpacking; Landmark/Historic Site	National/State Park; Shopping; Hiking/Backpacking; Landmark/Historic Site	Shopping; Fine Dining; Swimming; Landmark/Historic Site	Shopping; National/State Park; Fine Dining; Landmark/Historic Site	Shopping; Casino; Swimming; Museum

Note: Trip expenditures do not include travel to or from Arizona.

The sum of visitors across all regions is greater than the total visitation for the state because of some overlap in visitors to each region.

Source: Arizona Office of Tourism 2018.

The Phoenix & Central Arizona region attracts most of the state's visitors, and visitors stay longer in the Phoenix & Central Arizona region than any other region of the state. Figure IV-2 shows travel effects by county throughout the state.

Figure IV-2.
2017 Arizona County Travel Effects

County	Travel Spending		Related Travel-Generated Impacts				
	Total (\$Million)	Visitor (\$Million)	Earnings (\$Million)	Employment (jobs)	Local Taxes (\$Million)	State Taxes (\$Million)	Total Taxes (\$Million)
Apache	118	106	37	1,650	3.9	5.9	9.8
Cochise	326	304	84	3,630	13.5	14.9	28.4
Coconino	1,447	1,397	403	13,200	72.5	62.3	134.8
Gila	294	285	78	2,940	9.5	13.4	22.9
Graham	63	56	14	880	2.7	3.0	5.7
Greenlee	13	12	2	110	0.3	0.7	0.9
La Paz	146	142	36	1,350	5.3	6.4	11.7
Maricopa	14,036	10,963	4,542	101,660	698.6	546.3	1,245.0
Mohave	584	541	183	7,040	23.3	27.8	51.1
Navajo	331	312	107	4,110	14.0	16.0	30.0
Pima	2,911	2,353	756	25,500	74.1	126.7	200.8
Pinal	691	617	185	7,090	25.3	33.3	58.5
Santa Cruz	239	231	55	2,100	7.9	9.7	17.6
Yavapai	843	800	244	9,400	40.9	38.0	78.9
Yuma	635	588	164	6,400	22.6	28.2	50.8
Arizona Total	22,677	18,708	6,889	187,060	1,014.0	932.0	1,947.0

Note: The sum of county visitor spending is less than statewide visitor spending because a portion of county ground transportation is allocated to "other travel" at the county level.

Source: Dean Runyan Associates and Arizona Office of Tourism 2018.

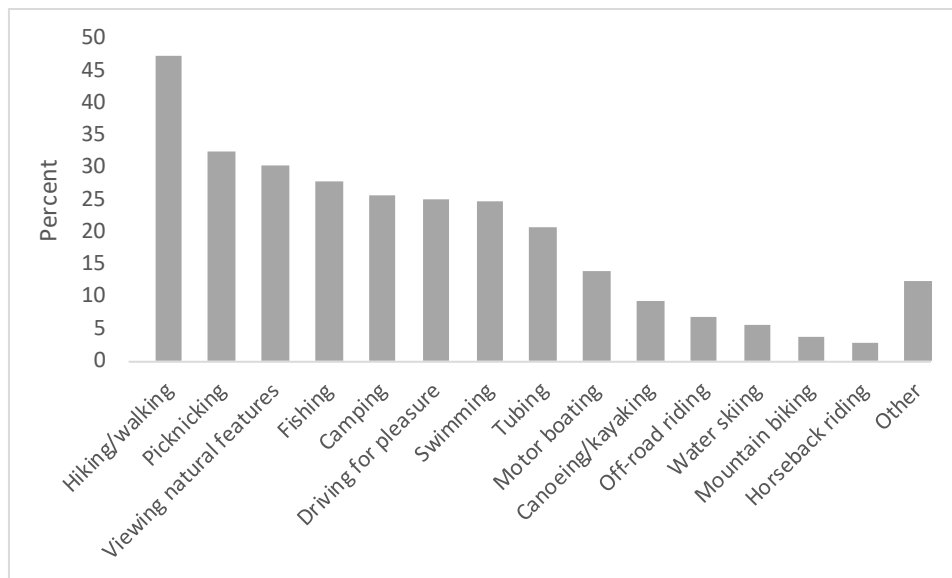
Within the Phoenix & Central Arizona region, the economic effect of tourism is relatively more important to Pinal County than to Maricopa. In Pinal County, travel-generated employment in

2016 (the most recent year for which BEA employment data is available) was approximately 7 percent of total county employment. In contrast, travel-generated employment in Maricopa County constituted approximately 4 percent of total county employment (BEA 2016).

The tourism economy in Superior, Pinal County and Central Arizona. The tourism economy of the Copper Triangle, which includes Pinal and Gila counties as well as the Town of Superior, is dependent on natural amenities to draw tourists to the area. Groups come to the area to enjoy hiking, OHV use, horseback riding, visit state parks, and attend cultural events. Outdoor recreationists, including both residents and non-residents of Arizona, come to the area to hike sections of the Arizona Trail and Aravaipa Canyon, rock climb, swim, and enjoy the views of the landscape on state highways 77 and 177 and event attendees are attracted to the area by the annual cultural events that take place each year (ASU 2016).

Several surveys have been conducted to understand what types of activities visitors participate in when they decide to visit the region. In 2014, the University of Arizona conducted a survey of about 400 users of Tonto National Forest on behalf of the USDA Forest Service. The Tonto National Forest receives more than 5.8 million visits each year (USFS 2018). The southern portion of the Tonto National Forest includes areas around the Town of Superior. In the survey, respondents were asked which activities they participate in when they visit the forest. The results showed that about 50 percent of visitors to the area participate in hiking, followed by 32 percent who picnic, and 30 percent enjoy the views of the landscape (Figure IV-3). About 25 percent of visitors also participate in fishing, camping, swimming, and pleasure driving. Less than 10 percent of visitors participate in activities like canoeing, water skiing, and horseback riding (ASU 2014).

Figure IV-3.
Percent of Visitors to Tonto National Forest Participating in Various Activities



Source: Arizona State University 2014.

The Tonto National Forest visitor survey results were similar to a separate survey conducted by ASU in 2013 and 2014 with visitors to the Boyce Thompson State Park, which hosted more than 64,000 tourists in 2017 (Arizona Office of Tourism 2018). The survey found that the state park’s visitors participated in multiple activities, including hiking (58 percent); wildlife viewing (54 percent); camping (15 percent) and picnicking (15 percent) (ASU 2017). Trails, like the Arizona Trail and the Legends of Superior Trail (LOST), are also popular attractions for tourists visiting Pinal County and the Town of Superior (Arizona Commerce Authority 2017).

The area’s many off-highway vehicle (OHV) routes are also popular draws for tourists. Several popular trails are located in or near the Town of Superior and throughout Pinal and Gila counties. According to a report prepared by the Arizona Department of Game and Fish:

“...there is a significant amount of OHV activity within and adjacent to the proposed Resolution Mine project area. National Forest lands north and south of US Highway 60 just west of Superior, the Mineral Mountains on BLM, and the Desert Wells OHV area just west of Superior on state trust lands receive high levels of activity and are considered hotspots for OHV recreation just outside the metro Phoenix area.” (AGFD 2018).

OHV recreation and tourism generate significant economic effects in the counties surrounding the proposed mine (Figure IV-4). In Pinal County, OHV recreationists and tourist spend approximately \$192 million dollars within the county. Fuel, lodging, and food from restaurants and grocery stores account for the majority of expenditures. The total spending within Pinal County supports an estimated 1,561 jobs, paying total annual wages of \$34 million. In Gila County, OHV recreation and tourism directly contributes about \$171 million to the county’s economy each year, employing approximately 1,877 people in full and part-time positions. The economic effect of OHV recreation and tourism is largest in Maricopa County, where annual expenditures total \$1.9 billion. An estimated 18,620 jobs are created as a result (Silberman 2003).

**Figure IV-4.
Economic Effect of OHV Recreation and Tourism in Three Arizona Counties (\$ millions), 2018**

Economic Impact	Pinal County	Gila County	Maricopa County
Total OHV Expenditures	\$192.13	\$171.11	\$1,928.50
Full and part-time jobs	1,561	1,877	18,620
Total Multiplier effect	\$216.83	\$195.39	\$2,537.68
Salaries and wages	\$34.36	\$31.67	\$609.04
State tax revenue	\$8.38	\$5.96	\$111.47

Note: The table values were updated from Silberman (2003) using the Bureau of Labor Statistics Consumer Price Index. Job projections were updated by assuming the ratio of employment per \$1 million in total expenditures remained constant between 2002 and 2018.

Source: Silberman, 2003; Bureau of Labor Statistics (2018).

In total, tourists from outside Pinal County accounted for about 402,100 OHV activity days in 2002, the most recent year for which data are available at the county-level. In Gila County, tourists from other areas accounted for a total of 230,332 OHV activity days in 2002, while tourists from outside of Maricopa County accounted for 1,034,536 of the County’s OHV activity days (Silberman 2003).

Potential Effects of Proposed Resolution Copper Mine on the Tourism Economy

The proposed mine would have operations located east and west of the Town of Superior. The tailings produced by the proposed mine would be stored at one of four sites currently being considered as alternatives. The activities at each of the proposed sites would affect the region's tourism economy. Most of the effects would occur in the Town of Superior and Pinal and Gila counties.

Previous studies of mining's effect on tourism have found that operational mines can have both negative and positive effects on a region's tourism economy. In some cases, growing demand for mine workers can 'crowd out' employment in other industries, including tourism (Dwyer et al. 2016). Evidence from the coal-mining regions of the Appalachian Mountains suggest tourists may avoid areas where mining is prevalent (Betz at al. 2014), but evidence from a copper producing area in Utah suggests that industrial sites may increase tourism as part of a phenomena described as 'industrial tourism' (Andreadakis-Rudd and Davis 1998).

Ultimately, tourist's response to the proposed mine would depend on their individual preferences and the mine's permitted operating plan. Evidence from survey data referenced above suggests that tourists are primarily attracted to the area surrounding the proposed mine operations for the natural amenities and recreational opportunities. If there is a perception that the proposed mine would degrade or destroy these amenities, nature-based tourists – the primary type of tourists visiting the area – may respond by choosing to recreate elsewhere. If the proposed mine's permitted operating plan mitigates the proposed mine's most negative effects on the region's natural amenities, the effect on nature-based tourism could be small and at least partly offset by an increase in industrial tourism.

The proposed mine and its associated facilities are distributed across a large amount of land in Pinal and Gila counties where nature-based tourism is the primary tourism activity. As a result, the proposed mine's effects on nature-based tourism will vary by location and activity. The remainder of this section discusses the effects that each site would have on the region's nature-based tourism economy.

East Plant Site. The operations at the East Plant Site (EPS) would affect some of the natural amenities that attract tourists to the area. The EPS is located on approximately 1,544 acres of land belonging to the USFS, including 1,500 acres of land that will subside, ending the use of the area by the general public. The EPS and subsidence zones will affect the Oak Flats campground, an area that is popular with campers, picnickers, hikers, rock climbers. OHV activities will also be affected by the proposed mine's operations. Portions of Forest Road 315, a popular off-road loop between US Highway 60 and SR177, would be eliminated by the activities at the EPS and the eventual subsidence of the area. In total, the Arizona Game and Fish Department (AGFD) estimates that about 14 miles of motorized off-road trail would be lost in addition to 433 acres of dispersed camping.

The site is also used for hunting, although according to AGFD the area does not contain a disproportionate amount of habitat favoring any particular species of interest to hunters. In total, AGFD estimated that the effects of the proposed mine at the East Plant Site would reduce

the number of hunter days at the site by 188 per year. This would lead to a direct reduction of \$10,510 worth of spending in the local economy, which would equal a nominal value of \$630,480 over the 60-year life of the proposed mine (AGFD 2018).

West Plant Site. The West Plant Site (WPS) is located on private land near the town of Superior's northwest edge. The WPS was formerly used by the Magma Mine as the site of its copper concentrator. The proposed mine would increase the scale of industrial activity at the site, but the proposed activities would be consistent with the site's historical use. The increased industrial activity could create beneficial effects on the Town's tourism economy for tourists interested in mining activity.

Near West Tailings Site. The area on and around the Near West Tailings alternative is used for a variety of activities by visitors from outside Pinal County. The area is popular with hunters due to its populations of mule deer, javelina, quail, and predators. According to a survey and mapping exercise conducted by AZFGD, the site has some of the highest rates of use amongst hunters. The Near West Tailings alternative would reduce the number of hunting days on the site by approximately 1,200 hunter-days per year, amounting to a reduction in direct expenditures of \$66,920 per year or \$4.0 million over the 60-year operational time horizon of the proposed mine (AGFD 2018).

AGFD also estimated that the Near West Tailings alternative would affect about 32 miles of motorized off-road trails and eliminate 1,175 acres of dispersed camping. This would lead to more crowding and congested conditions that have the potential to increase competition and conflict between activities. Based on these projections, the AGFD believes the recreational and tourism effects of this alternative would have the largest negative effect on tourism and recreation of any of the proposed alternatives.

Silver King Tailings Site. The site at the proposed Silver King alternative receives a moderate to high number of hunters who use the area to hunt mule deer and predatory animals. The higher-elevation areas of the site are the most valued by hunters because the quality of mule deer habitat increase with altitude at the site. According to the AGFD the proposed alternative would have a negative effect on mule deer populations, which would reduce the number of hunting days by about 1,078 per year. This would reduce the amount of direct expenditures of hunters by about \$60,368 per year or \$3.6 million over the 60-year operational time horizon of the proposed mine (AGFD 2018).

The alternative would also affect the aesthetics of the area, particularly for users of OHV routes and other tourists who value the views and vistas of the Superstition Mountains. The aesthetic effects could change people's desire to visit and recreate in the area. In total, the AGFD estimates that there are about 24 miles of motorized OHV routes and 619 acres of dispersed camping that would be affected.

Peg Leg Tailings Site. The Peg Leg alternative site contains a variety of species that are popular with hunters, including predators and small game. This also makes the site popular with wildlife-watchers. The AGFD estimated that the site supports about 219 hunting-days each year. Under this alternative, the hunting activity would be lost, resulting in a loss of direct economic activity amount to \$12,254 per year or \$735,269 over the 60-year life of the proposed mine

(AGFD 2018). Development of this alternative would also have a negative effect on the aesthetics of the area, particularly for visitors driving from the Florence Kelvin Highway and for outdoor enthusiasts who value pristine views of the Mineral Mountains and the Gila River. Overall, tourism and recreational use of the site is relatively low and the AGFD does not expect that development of this alternative would lead to substantial displacement or congestion.

Skunk Camp Tailings Site. Hunting is permitted for several species and the site is popular with people who enjoy watching wildlife. <More information on the effects of the Skunk Camp Alternative will be provided by AGFD>

SECTION V.

Effects on Amenity-Based Migration

SECTION V.

Effects on Amenity-Based Migration

Residents of Pinal and Gila counties – including residents of the Town of Superior – are attracted to the area in part because of its proximity to undeveloped public lands, like the Tonto National Forest, that contribute to the area’s high quality of life. While quality of life is very difficult to measure, there is a substantial body of literature that has linked proximity to public lands like national forests and wilderness areas to residential and business location decisions and the associated economic outcomes. This section of the report discusses this concept – known as amenity-based migration – and applies the results of recent research to evaluate potential socioeconomic effects associated with the proposed mine.

Amenity-based Migration in the West

Amenity-based migration describes the movement of people based on the draw of natural and/or cultural amenities (Gosnell and Abrams 2009). This type of migration is primarily focused on areas with an abundance of public lands, wild places, scenic character and a high quality of life. As a result, scenic landscapes contribute to this type of migration primarily due to their aesthetics and recreational amenities rather than their stocks of minerals, timber, and forage (Rasker and Hansen 2000).

Amenity-based migration has occurred in many former mining towns throughout the American West. Places like Telluride and Aspen in Colorado and Moab in Utah – all former mining towns – became symbols of amenity-based migration as the towns’ mining industries were replaced by the tourism and amenity industries. New jobs that ranged from ski-lift operators, waitresses, and bike technicians to attorneys and real estate agents replaced mining jobs, broadening each towns’ economic base. Resident educational attainment levels also increased. At the same time, the towns’ primary sources of income changed as new residents relied more on investment income and less on labor income.

The share of personal income that comes from investments is a good indicator of the amenity-based migration phenomenon (Rasker and Hansen 2000). In Teton County, Wyoming (home of Jackson) more than 50 percent of personal income is derived from investments. The ratio is similar for other popular amenity-based counties like Pitkin and Summit counties in Colorado and Grand County in southeast Utah. In contrast, only about 12 percent of personal income in San Juan County, New Mexico – which is heavily dependent on extractive industries – comes from investment sources (Headwater Economics 2018).

Amenity-based Migration in Pinal and Gila Counties

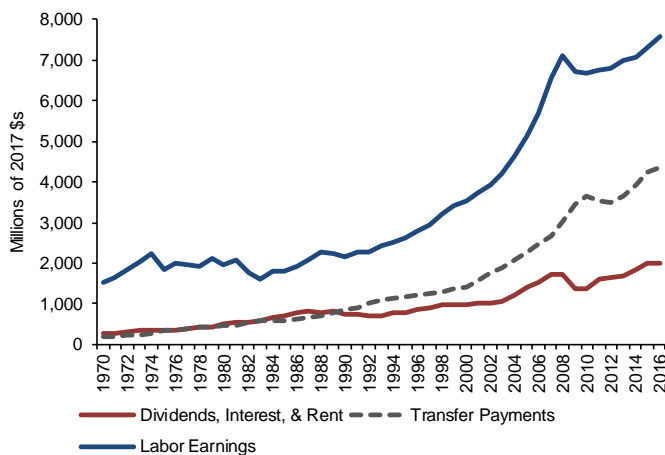
Pinal and Gila counties some amenity-based migrants, but the scale of such migration has been much smaller than in other amenity destinations in the West (High Country News 2012). The economies of both counties have not shown a decline in the importance of mineral extraction and manufacturing while other sectors gained more prominence; investment income does not

make up a large share of personal income; and the average educational attainment of residents has not risen substantially over time.

Instead, the mining, quarrying, oil and gas extraction, and manufacturing sectors remain a significant source of employment in Pinal and Gila counties. In Pinal County, these sectors combined to employ about 6.4 percent of the County’s population. Between 2001 and 2015, employment in these sectors grew by between 24 and 33 percent. In Gila County, the combined sectors employed about 12.5 percent of the County’s workforce in 2015. Between 2001 and 2015, Gila County’s manufacturing sector employment grew by 47.1 percent (U.S. Bureau of Economic Analysis 2017).¹

In an amenity-based economy the share of personal income derived from investments is generally larger than income derived from labor earnings and transfer payments (Rasker and Hansen 2000). In Pinal and Gila counties, labor earnings – rather than investment income – were the fastest growing component of personal income between 1970 and 2016 (Figure V-1). Transfer payments, which include Social Security, Medicare, Food Stamps, veterans’ benefits, unemployment, and other entitlements, were the second fastest growing component while personal income derived from investments including dividends, interest, and rent grew at the slowest rate.

Figure V-1.
Components of Non-Labor Income Compared to Labor Earnings for Pinal and Gila Counties, 1970 to 2016



Source: U.S. Department of Commerce Bureau of Economic Analysis 2017.

Educational attainment statistics from Pinal and Gila counties also suggest that amenity-based migration has not had a large effect on the two counties. In some of the best-known areas for amenity-based migration more than 60 percent of the population has at least a four-year college degree (U.S. Census ACS 5-year averages 2012 to 2016). In Maricopa County, home of the Phoenix Metro Area, about 31 percent of the population has at least a four-year college degree.

¹ No data were available from 2001 to calculate the growth of the mining, quarrying, and oil and gas extraction sector.

In contrast, about 19 percent of the population of Pinal County and about 18 percent of residents in Gila County gave at least a four-year college degree (U.S. Census ACS 5-year averages 2012 to 2016).

The data also indicate that amenity-based migration has not been a prominent migration trend in the Town of Superior. The Town has an older, but less educated population compared to Pinal County. Between 2012 and 2016, only about 8 percent of residents in Superior had at least a four-year college degree. The Town's economy also shows a relatively high degree of dependence on mining and manufacturing and a lack of the diversification that be expected to develop as part of an amenity-based migration trend. Between 2012 and 2016, mining and manufacturing employed an average of 20 percent of the Town's workforce. Employment in arts, entertainment, and recreation accounted for an average of less than 5 percent of total employment and professional services employed about 9 percent of the workforce during this time (U.S. Census ACS 5-year averages 2012 to 2016). In contrast, in Sedona, Arizona – a small city in central Arizona known for amenity-based migration – about 32 percent of the workforce worked in the arts, entertainment, and recreation and professional services sectors between 2012 and 2016. During that same time, less than 6 percent of Sedona's workforce was engaged in mining and manufacturing (U.S. Census ACS 5-year averages 2012 to 2016).

Demographic Effects from Changes in Natural Amenities

While Pinal and Gila counties, and the Town of Superior, may not currently be popular destinations for amenity migrants like some former mining communities, the situation could change. The region boasts many natural amenities that may attract amenity migrants in the future, including close access to outdoor attractions and a relatively low-cost of living. The study team used available research to estimate the potential effect of the mine on future amenity-based migration.

In 2011, the U.S. Forest Service estimated the effects of specific natural amenities on rural population migration through a statistical analysis of over 2,000 rural counties in the U.S. The results were used to forecast changes in migration based on changes to natural amenities due to climate change (Cordell et al. 2011). The analysis isolated the effect that the amount of federally-owned land within 100 miles of a county has on rates of rural migration and found that an increase of one acre of federally-owned land per resident increases annual net migration to a county by an average of 360 residents. The analysis controlled for the effect of other factors, including the presence of mountains, coastline, annual snowfall, warmer winter temperatures, rangeland, forestland, and pasture.

The proposed Resolution Copper Mine would have a footprint ranging from about 7,840 acres to more than 15,360 acres. Federally owned lands would make up between 16 and 84 percent of the proposed mine's footprint under the various alternatives in this EIS. The loss of federally owned land available for public use and recreation could adversely affect amenity-based migration to the area. Whether or not there could be further negative effects to amenity-based migration because these lands are not only being lost to public use and recreation, but also converted into mining and tailings facilities cannot be determined from the 2011 Forest Service analysis.

Figure V-2 below, applies the model from the 2011 U.S. Forest Service study to the changes in land amenities that would occur under each alternative in the Resolution DEIS. The model is applied to Pinal County, which contains the majority of private, public, and state lands that would be affected by the proposed mine. Potential effects to Gila County and the Town of Superior are discussed qualitatively.

Figure V-2.
Potential Effects to Net Migration in Pinal County by Alternative

Acreage of proposed Resolution Copper Mine	Plant Sites and Subsidence Rings	Tailings Alternatives				
		Near West	Near West Modified	Silver King	Peg Leg	Skunk Camp
Total (acres)	2,856	4,987	4,987	5,691	12,503	12,015
Federally owned land (acres)	1,593	4,933	4,933	5,634	8,065	887
Private (acres)	649	53	53	57	172	2,534
State (acres)	1,166	0	0	0	4,267	8,595
Change in net migration due to loss in federally owned lands	-1	-4	-4	-5	-7	-1
Change in net migration as a percent of county population	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%

Note: Total population of Pinal County was 417,540 in 2016. Plant Sites and Subsidence Rings include area estimates for the West and East Plant Sites, the zone of continuous subsidence, the MARRCO Corridor, and the Filter Plant/Loadout Facility. The area of each tailings alternative represents the total area enclosed by the alternative's fence line and the tailings corridor.

Source: BBC Research and Consulting; Resolution Copper Company (acreage estimates).

Based on the Forest Service Model, domestic migration to Pinal County could decline by 5 people per year under the Proposed Action or by up to 7 people per year under the Peg Leg Alternative. The Skunk Camp Alternative would have the smallest effect on future migration to the County (1 less person per year). These effects represent less than one tenth of one percent of the County's 2016 population. A proportional effect in Gila County and the Town of Superior would indicate almost no reduction in future rates of migration.

Overall, both recent trends and the analytical model developed by the Forest Service indicate the proposed mine would have little effect on amenity-based migration. Pinal and Gila counties, as well as the Town of Superior, have no pronounced pattern of amenity-based migration to date. The analytical model indicates that changes in natural amenities due to the proposed mine (including effects from construction, operation and reclamation) could reduce net domestic migration to Pinal County by about 120 to 480 people over the 60-year life of the proposed mine. Based on population projections for Pinal County from Arizona Office of Economic Opportunity, that reduction would amount to less than one tenth of one percent of the County's projected future growth (OEO 2018). A similar effect in Gila County would reduce domestic migration by 16 to 64 people over the 60-year life of the proposed mine.

SECTION VI.

Effects on Property Values

SECTION VI.

Effects on Property Values

In addition to the potential economic costs of the proposed Resolution Mine in terms of effects on economic activity (e.g., tourism and amenity-based migration), the mine and tailings piles could also impose economic costs on nearby residents and landowners in the form of reduced property values.

Hedonic Property Value Approach

Numerous studies since the early 1970s have investigated the effect on property values of proximity to special, distinguishable features and activities. These special features, near but not necessarily part of the real estate to be valued, are referred to as *externalities*. These externalities include both positive and negative attributes, from parks and beaches to power lines and hog farms. There are numerous methodological approaches to examining the effect of externalities on property values—such as contingent valuation methods like the survey-based willingness-to-pay or willingness-to-accept techniques—but most studies of externalities affecting property values have used a technique known as hedonic valuation.

Hedonic valuation is an analytical method for explaining prices for a good based on multiple characteristics and is an analysis particularly used in real estate economics and consumer price index (CPI) calculations. Using multiple regression equation analysis, hedonic valuation can identify the magnitude of an effect that a single housing attribute (e.g., proximity to a nearby copper mine) has on the sale price of that property while controlling for any other identifiable characteristics of that property (e.g., square footage, building age, or quality of construction).

Houses are varied and it is difficult to estimate demand generically. Instead, hedonic valuation defines a house as the sum of its component characteristics. Hedonic regression treats these attributes separately and estimates values (in the case of an additive model) or price elasticity (in the case of a log model) for each attribute or bundle of attributes.

The literature of hedonic valuation of residential real estate falls into two general categories. The first, which is the theoretical literature, focuses on identification of housing supply and demand equations and comparisons among equations of differing forms. The second category consists of the empirical literature that describes specific hedonic valuation investigations where the measurements of value are the implicit prices of a property's physical attributes as well as at least one additional attribute from the surroundings, such as an external amenity or disamenity.

In order to evaluate the price impact of an external attribute, effects of other attributes must be controlled. For example, *Palmquist, Roka, and Vukina (1997)* controlled for all characteristics that contributed to a home's sale price in order to estimate the effect of the proximity of a hog farm.

There is a consensus among economists as to the general factors that explain the market price of a property. For example, one well-known study—*Pompe and Rinehart* (1995)—investigated the effect of beach quality on the purchase price of single-family homes with and without water frontage in South Carolina. The authors used a standard hedonic valuation model—

$$P = f(s, n, x)$$

—where P is the selling price of a property. The expression includes structural characteristics (s), neighborhood characteristics (n), and external effects (x). The structural characteristics were age of house, size of living area, number of bathrooms, and having a fireplace. The neighborhood characteristics were distance to Myrtle Beach and whether the property sold after Hurricane Hugo in 1989. To measure the externality of interest—beach quality from the perspective of the property—the model included both width of the nearest beach at high tide and distance to the nearest beach multiplied by the width of the nearest beach at high tide. The model also controlled for a property’s ocean views, being on the water, and having a dock; all of these are attributes expected to affect property values.

The hedonic valuation model developed by *Pompe and Rinehart* is similar to that used across the economics and planning literature. For other representative examples, see *Bayer et al.* (2009); *Morancho* (2003); *Palmquist, Roka, and Vukina* (1997); *Palmquist* (1992); *Graves et al.* (1988); *Ridker and Henning* (1967); and *Levesque* (1994).

Hedonic studies are complex and have limitations. Many factors may contribute to the perceived value of any individual property. Not all of these factors can be measured. No model can explain 100 percent of the variation in the sale price of a home. The portion of the variation explained by hedonic valuation models of housing values is typically in the range of 70 to 90 percent.

In addition, housing markets vary substantially from place to place. For example, the square footage of a house is statistically significant in explaining valuation difference in almost every hedonic model of residential property values. While specific quantitative measurements of the effect of square footage on the total sales price cannot be generalized from one geographic area to another, it is reasonable to expect that square footage will be significant in future studies and should be included in the analysis.

Despite limitations, hedonic analysis provides an established and practicable basis for estimating the potential effect of externalities on real estate values. In this case, however, we are interested in the potential effects on future property values from the proposed Resolution mine. Because the mine does not yet exist, it is not possible to estimate its effects on the values of surrounding property values based on prior market transactions. Instead, the study team reviewed the hedonic valuation literature to identify the most comparable studies in other locations for the purpose of developing general estimates of the potential magnitude of effects of the mine on nearby property values.

Most relevant previous studies. Although the empirical literature includes many hedonic valuation studies spanning the past several decades, very few studies have focused specifically on the effect of mining on surrounding property values. The most recent study potentially relevant to the proposed Resolution mine was a national study focused on the impact of surface

coal mines on property values in the U.S. The Impact of Surface Coal Mining on Residential Property Values: A Hedonic Price Analysis was completed in 2011 (Williams 2011). The study employed the somewhat unusual approach of examining the impact of surface coal mining activity on median home values at the county level, using data from 13 states where there was a substantial amount of surface coal mining activity. Numerous county-level variables were included to control for variations between counties in structural housing characteristics, socioeconomic characteristics, and various environmental characteristics (including number of mines, mine production, and other variables such as climate, topography, and the presence of water features). Based on various model specifications, the impact of a surface coal mine on aggregate county residential property values was estimated at between \$8 million and \$40 million. These effects were relatively small on a percentage basis—reflecting a decrease in overall residential property values ranging from approximately 0.3 to 1.5 percent—but were statistically significant.

While the national study of effects of surface coal mines on county-wide property values provides evidence that large surface mines have an overall negative effect on property values, the study's results are not directly applicable to the proposed Resolution mine. The focus of the study was on coal mines, not copper mines, and on average the coal mining counties had smaller populations than Pinal County. Neither the aggregate estimates of the dollar reduction in property values nor the percent decreases in property values can reliably be transferred.

The previous hedonic property value study most relevant to the proposed Resolution mine is an earlier analysis based on the more traditional approach of evaluating the sales values of individual properties. Air Quality and View Degradations due to Copper Mining and Milling: Preliminary Analysis and Cost Estimates for Green Valley, Arizona ("Green Valley study") was published in *Nonrenewable Resources* in 1996. For the purpose of evaluating the potential effects of the Resolution mine on nearby property values, there are several advantages in using the information from the Green Valley study. The study focuses specifically on property value effects associated with copper mining and is based on another Arizona community south of the Pinal County border with Pima County.

One important limitation of the Green Valley study is that the analysis was based on real estate transactions over a relatively short four-month period. Only 20 properties in Green Valley were sold during that period, resulting in an unusually small sample for a hedonic property value study. However, the hedonic models based on those transaction had relatively strong statistical properties, and the estimated effects of proximity to the copper mines were consistently significant from a statistical standpoint.

The Green Valley study is now two decades old and the typical values of residential property in Green Valley may be quite different from typical property values in proximity to the proposed Resolution mine. Consequently, the most useful information from the Green Valley study for our purpose is the estimated percentage change in residential property values at varying distances from the copper mines rather than the absolute dollar impacts described in the study. The Green Valley study found that, relative to a home situated 10 miles or more from the copper mine tailings piles, homes in closer proximity experienced a decrease in value as shown in Figure VI-1.

**Figure VI-1.
Proximity Effect on
Property Values**

Source:
Air Quality and View Degradations due to
Copper Mining and Milling: Preliminary
Analysis and Cost Estimates for Green
Valley, Arizona (1996)

Distance to tailings piles	Decrease in home value
Within 1 mile	11%
Between 1 and 2 miles	9%
Between 2 and 5 miles	4%

Potential Property Value Effects from Resolution Mine

Applying the Green Valley study relationships between distance from the tailings piles and property values may somewhat understate the potential effects of the Resolution mine on property values. In addition to the distance variable, the Green Valley study also incorporated a variable to examine the additional effects on property values for homes that faced the tailings bank. This variable, also statistically significant, indicated an additional reduction in property values for properties that did face the tailings compared with those that faced away. The magnitude of this effect was relatively small compared to the distance variable—approximately one-third of the distance effect in scale. However, given the limited information in the Green Valley study publication and absent access to the original data, we cannot reliably transfer this effect to potentially impacted properties in proximity to the proposed Resolution mine.

The study team retrieved 2017 parcel information from the Assessor’s offices and GIS departments for both Pinal and Gila Counties. Pinal County would house the tailings piles for four of the five proposed alternative scenarios, while the tailings pile for the remaining alternative would be located on the Pinal-Gila county line.

For both counties, the study team focused on information from and effects on active, real, and taxable parcels for which the assessor’s offices maintain data. There are limitations to these data. For example, currently Gila County does not have digital parcel shapefiles available for all parcels in the county, and parcel data around the relevant portion of the Pinal-Gila County line is particularly sparse. For both counties, the study team requested all applicable and available information for any parcels located within seven miles of the perimeter of each tailings alternative, including the full cash value of the property.

This assessment of the projected aggregate property value effects due to proximity focuses on residential properties. Residential property sales are the most common in most real estate markets. Additionally, the Green Valley study focused on residential property sales, and it is appropriate to apply the resulting impact percentages to similar property types.

Figure VI-2 shows the total number of residential parcels within five miles of the perimeter of each tailings alternative along with the total projected property value reduction for each alternative and the corresponding percent change in property value for each alternative.

**Figure VI-2.
Total Projected Property Value Reduction**

Property within 5 Miles of Tailings Perimeter	Tailings Alternatives				
	Near West	Near West Modified	Silver King	Peg Leg	Skunk Camp
Number of Residential Parcels	1,370	1,370	1,181	8	31
Total Projected Property Value Reduction	\$3,059,395	\$3,059,395	\$5,472,374	\$69,178	\$57,575
Percent Change in Value	-4.1%	-4.1%	-10.6%	-6.3%	-4.0%

Source: Pinal County Assessor's Office (2018); Pinal County GIS Department (2018); Gila County Assessor's Office (2018); Gila County GIS Department (2018); BBC Research & Consulting.

As shown in Figure VI-2, the Silver King alternative is projected to have the largest impact on nearby property values, followed by the Near West and Near West Modified alternatives. The Peg Leg and Skunk Camp alternatives are more remote and would affect far fewer residential properties.

These estimates of potential effects on property values should be considered order-of-magnitude estimates based on relatively limited information. Unlike the results of an original hedonic property value study of an area, which would occur after mining has commenced and the local real estate market has had time to reflect corresponding changes, these estimates are based on applying the estimated percentage impacts from the Green Valley study to the properties surrounding each of the alternatives for the Resolution mine tailings. While the actual effects on property values could be considerably larger or smaller than these estimates, there is sufficient information from both the Green Valley study and other previous hedonic property value studies to conclude that a measurable effect on the value of nearby residential properties would be likely to occur.

The Green Valley study does not provide any information regarding effects on the values of more distant properties. This does not rule out the possibility that values of properties further from the mine or tailings could also be affected.

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