Exaggerating the Net Economic Benefits of the Proposed Resolution Copper Mine, Superior, Arizona: A Critical Review of Resolution's Economic Impact Analysis

A Report Prepared for the

San Carlos Apache Tribe
San Carlos, Arizona

by

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Executive Summary

The Resolution Copper Company (Resolution) is exploring a large copper ore body about four miles east of the Town of Superior, Arizona. Resolution has described this ore body as one of the great copper ore discoveries in the last 100 years and has proposed to build one of the largest underground copper mines in the world to extract that ore.

To build public support for this proposed mine, Resolution hired Elliott D. Pollack & Company (Pollack) to prepare an economic impact analysis of the mine. Pollack submitted a report, "Resolution Copper Company Economic and Fiscal Impact Report, Superior, Arizona" (Pollack Report). Resolution has made wide use of that study in its presentation of the public benefits that Resolution projects will flow from the proposed mine to the State of Arizona and the nation if the mine is successfully permitted and reaches its planned production.

The Pollack Report concluded that there would be very large positive impacts associated with the building and operating of the proposed Resolution Mine. Among the estimated benefits were $61 billion in additional economic output, $20 billion in tax revenues to various government bodies, $14 billion in wages, and 238,000 additional person-years of employment.[1] These appear to be spectacularly large economic impacts.

Power Consulting was engaged by the San Carlos Apache Tribe to carefully review the Pollack Report and prepare a study that explains how Resolution Copper Company's consultant estimated these huge economic benefits. This report presents the results of our analysis of the Pollack Report's methods and its conclusions.

As explained in detail in our full report that follows, we came to the following conclusions:

1. Resolution's economic impact study *assumed* that the mine would produce only benefits. The study *imagined there* would be no costs associated with the mine.

Despite being labeled an *economic* impact study, that study chose to look only at the **positive** impacts associated with the mine. The Pollack Report explicitly states that it

[1] Tables A and B.

assumed that there will be no environmental costs associated with the proposed mine and that the construction and operation of that mine would not conflict with any other economic activities or values. This assured that the study would be a "pure benefits" analysis. The proposed mine, in effect, was assumed to be a "free lunch," violating the economic convention to avoid such fantasies.

2. Resolution's economic impact study ignored the historic volatility of copper mine operations in Arizona and elsewhere and *assumed* that the proposed mine would operate at a constant level of production for half a century.

As all the history of actual copper mining in Arizona and elsewhere has repeatedly demonstrated, copper mine production, employment, payroll, and tax payments fluctuate widely from decade to decade due to changing international metal market conditions. Resolution's projections assume that "this time will be different," despite a century and a half of evidence to the contrary. Resolution's study provides no evidence as to why anyone would expect that the volatility within the copper industry in the past would not continue into the future. That volatility in copper production, employment, payroll, and tax payments regularly disrupts households, communities, and governments. This is a significant cost associated with copper mining.

3. Historically, the jobs associated with metal mining and the high wages associated with mining jobs have not reduced unemployment nor boosted local economic vitality.

As the Town of Superior has discovered, Resolution's hiring of hundreds of workers did not lead to declining unemployment rates. Instead unemployment numbers and rates skyrocketed as more people moved in than there were jobs available. The region surrounding the proposed Resolution Mine has more than a century of history with copper mining. That has not been a history of sustained prosperity and economic vitality. There are important lessons to be learned from that experience that should inform public decisions about the proposed Resolution Mine.

4. Resolution's proposal to adopt an automated and robotic technology to mine its copper ore deposit will reduce the blue-collar jobs that local residents can fill and shift the mining workforce towards a smaller but more highly skilled set of workers.

Over the last half-century technological change in copper mining has consistently displaced workers, systematically reducing the number of workers required for any given level of copper production. Even when copper production has been rising, employment in copper production has been falling. That technological change has not come to an end. Resolution's automated and robotic approach to mining its ore deposit will reduce the number of workers needed and shift the remaining workforce away from blue-collar workers towards more highly skilled workers who can operate the mine remotely and maintain the computer controlled automated mining systems. This technical work force will not necessarily be located at the mine site.

5. Resolution's economic impact report recognizes that most of the economic benefits will <u>not</u> flow to the region immediately around the proposed mine but will flow to the rest of the State of Arizona and the nation.

The Resolution economic impact study was carried out on a statewide and national basis because so many of the projected benefits were expected to be primarily felt outside the small town and rural area in which the mine would be located. For instance, 71 percent of the projected tax flows to governments would go to the federal government, not to Arizona units of government. Resolution's economic impact study did not analyze the economic impacts to the local area where the mine would be located. This study *does* focus on those local impacts.

6. Copper mining is very land and environment intensive, causing significant degradation of natural landscapes and the potential for serious pollution problems. These environmental impacts have significant long-run economic implications.

Mining tends to displace most other economic activities in the region around the mine. The spectacular environmental degradation combined with the instability associated with mining operations actually discourages individuals, families, and businesses from locating in mining towns. That is why mining communities tend to be so specialized in mining, lacking in the economic diversification that can stabilize communities in the face of commodity price fluctuations. People and businesses are not drawn to mining areas except for the job opportunities. When those job opportunities "flicker" or disappear, residents and businesses disappear too. That is how "ghost towns" are generated.

Families and businesses are increasingly "footloose" in the sense of having choices as to where they locate. The "quality of life" associated with communities, their overall attractiveness as a place to live, work, and raise a family, are increasingly important for cities and regions to maintain a competitive edge in holding and attracting residents and economic activity. The landscape, environmental, and social costs associated with metal mining tend to discourage residential and business location.

7. Copper mining requires large quantities of water for processing the ore. Mining very deep deposits such as the Resolution ore body, requires the extraction of large quantities of ground water. The mining of sulfide copper ores causes serious water pollution problems such as acid mine drainage that can require water treatment in perpetuity. All of these water problems tend to displace other current and future economic activities.

The Resolution Mine will be located in a very arid region where available water resources already constrain economic activity. The mine will increase competition for water, diverting water from existing uses to mining while at the same time drawing down the local water table to remove ground water from the area around this deep ore deposit. In addition, over time, the mine site is likely to become a source of dangerously

polluted water. This makes it unlikely that the Resolution Mine can contribute to sustainable economic development in the area around the mine.

8. The Resolution economic impact analysis grossly exaggerated the positive economic impacts associated with the proposed mine.

i. Instead of reporting the annual level of various projected impacts, the Resolution analysis *summed* the annual impacts *over a 64-year period* and reported that cumulative number as the impact. That is how multi-billion dollar impacts were derived. This makes as much sense as reporting that each mining job was projected to pay $3.8 million dollars instead of saying that the annual pay associated with the jobs would be $75,000 and the mining was projected to last 50 years. Many of Resolution's economic impacts are 64 times too large.

ii. Consistent with a "free lunch" approach to economic impact analysis, the Resolution analysis of fiscal impacts assumes that the mine, its operations, its workforce, and all of the "multiplier" impacts on economic activity would **not require any** public services such as roads, road repairs, police and fire protection, education for children, social services, etc. According to Resolution's impact analysis, the new economic activity would generate taxes but absolutely no demand for expanded public services or degradation of existing public services because of increased use.

iii. A statewide and nation-wide stance was taken, rather than a local stance. That approach allowed for much larger impacts to be estimated, which is misleading.

iv. Copper production, employment, payroll, or tax revenues were assumed to be constant over a fifty-year period. None of the downward fluctuations that have plagued the industry for a century and a half were included in the projections.

9. The local economic impacts on the region surrounding the proposed mine would be only a fifth to a quarter of the size of the statewide impacts the Resolution study projected.

If one applies the same economic impact model that Resolution's consultant used but focus that economic model on the region surrounding the mine rather than on all of Arizona or the entire nation, the projected impacts are a small fraction of what the Pollack Report estimated.

Table ES-1 shows this for employment and payroll impacts. We defined a local study area by combining nine contiguous zip code areas. Our local study area encompassed

Superior, Globe-Miami, San Carlos, Kearny, Hayden, and Winkelman and adjacent rural areas in Pinal and Gila Counties.

Table ES-1.

Comparison of Economic Impacts: Statewide v. Local Zip Codes				
Type of Impact	Employment Impacts		Payroll Impacts ($millions)	
	Pollack Statewide	Power Local Zip Codes	Pollack Statewide	Power Local Zip Codes
Direct	1,429	342	$108.6	$27.5
Indirect	934	221	$57.3	$17.2
Induced	1,356	329	$56.0	$11.5
Total	3,719	893	$221.9	$56.2
Source: IMPLAN modeling by the author; Pollack report, Tab. 16.				

The flow of tax revenues to the local governments within our local study area was considerably smaller as compared to the huge tax flows estimated for all of Arizona by the Resolution economic impact analysis. While Resolution's contractor estimated millions of dollars in enhanced revenue flows to governmental units, our estimates for the local study area are in terms of thousands of dollars. See Table ES-2. Our report shows similarly very modest impacts on tax revenues when employee payments of sales taxes, local government sharing of state sales taxes, income taxes, residential property taxes, etc. are taken into account. See Table E in the main body of the report.

Besides the Resolution Mine having only modest impacts on the flow of tax revenues to local government in the vicinity of the mine, those tax revenues will fluctuate with mine production in the future just as they have in the past. The unstable and unreliable character of these tax flows reduces their value to local governments.

Table ES-2.

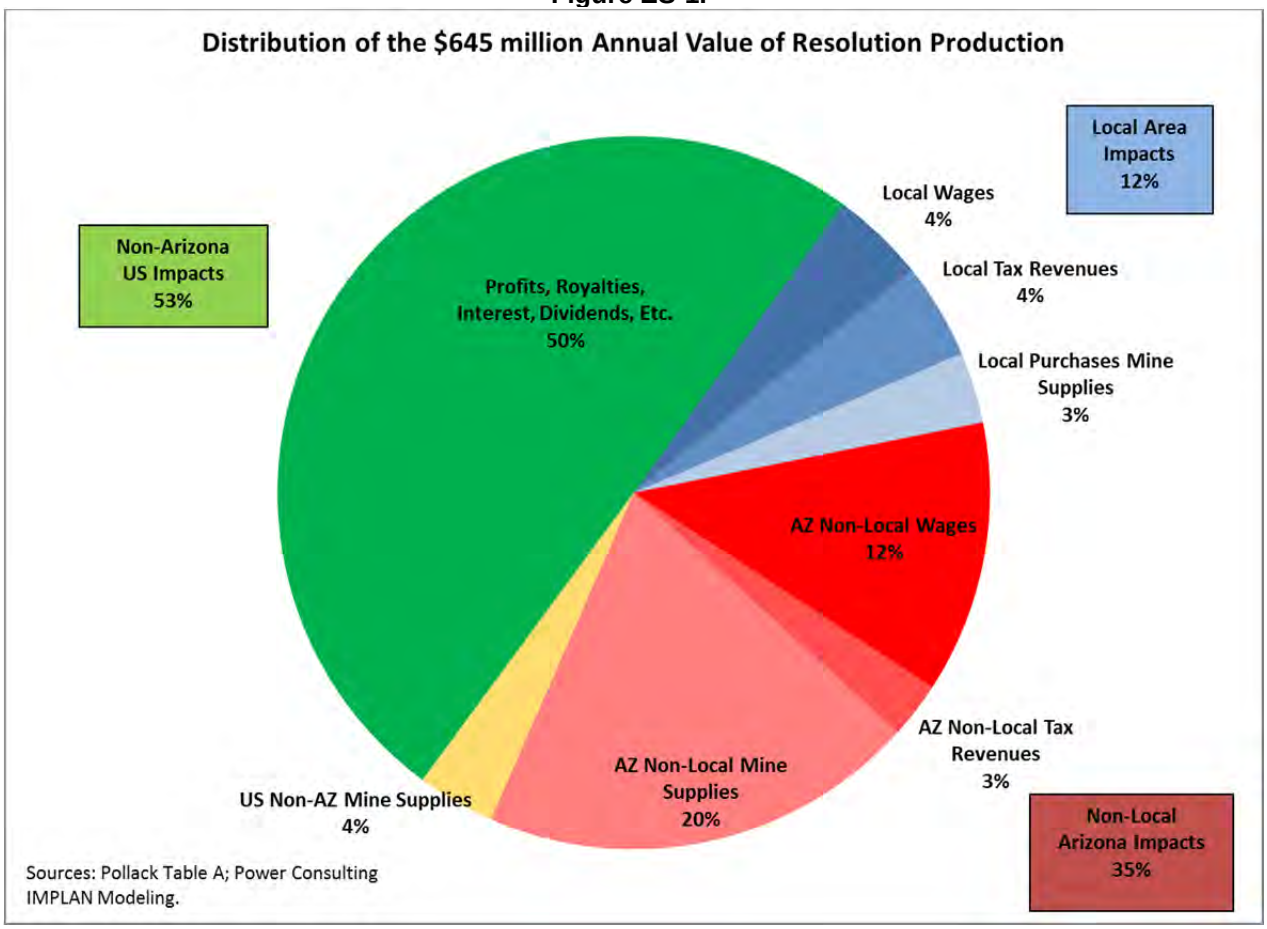
Annual Distribution of Mine Severance and Corporate Profit Taxes to "Local" Government Units							
Pollack Report (Table 9)				Power Consulting			
Local Government Unit	Severance Tax Distribution	Corporate Income Tax Distribution	Sum of These Two Taxes	Local Government Unit	Severance Tax Distribution	Corporate Income Tax Distribution	Sum of These Two Taxes
All County Governments in Arizona	$3,934,375	$0	$3,934,375	Pinal and Gila Counties	$ 264,282	$ -	$ 264,282
All Incorporated City Governments in Arizona	$2,428,125	$4,020,313	$6,448,438	Six Incorporated Towns in Nine Zip Code Area	$ 7,334	$ 12,143	$ 19,477
Total	$6,362,500	$4,020,313	$10,382,813	Total	$ 271,616	$ 12,143	$ 283,759

Sources: See Tax Revenue Appendix

10. Most of the value created by the Resolution Mine will flow out of state. Very little of it will stay in the region where the mine and its environmental and social impacts will be most directly felt.

Only about 4 percent of the mineral value produced by the proposed mine would flow to local residents in the form of local wages. About one-eighth of the total value of output would affect the local study area. About a third of the value of total mine output would impact the state as a whole. Over half of the value created would flow out of state to national and international investors. See Figure ES-1 below.

Figure ES-1.

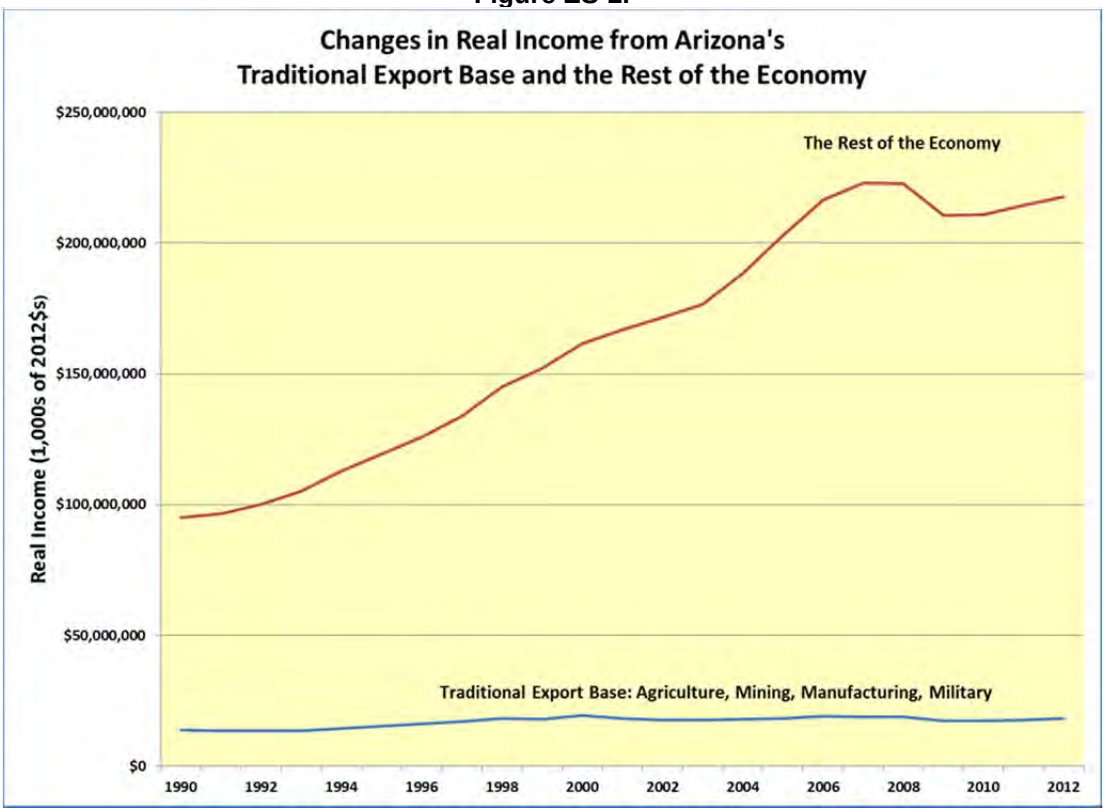


11. The Arizona economy has not significantly depended on copper mining as a source of economic vitality for almost a third of a century. The Arizona economy has diversified significantly beyond the traditional "copper, cattle, and cotton" historical economic base. Good public economic policy cannot be based on an understanding of the Arizona economy that relies on a view through the rear-view mirror.

Over the last half-century, the direct contribution of metal mining to the total personal income received by residents of Arizona declined from four percent to *four-tenths of one percent*. That is, metal mining's importance as a source of income for Arizona residents fell to a tenth of what it used to be. In 2011 only three-tenths of one percent of Arizona jobs were in the copper industry. Despite that relative and absolute decline in the role of metal mining in the Arizona

economy, the state economy was able to expand steadily until the Great Recession struck the entire nation. See Figure ES-2 below.

Figure ES-2.



In developing informed public economic policy in Arizona this successful diversification of the Arizona economy has to be analyzed in order to determine which economic activities are most likely to be providing jobs with reasonable pay in the future. Looking back at the distant past is not very useful in recognizing the structure of the contemporary and future economy.

Over the last two decades many sectors of the Arizona economy have been creating thousands of relatively high-paying jobs *each year*. See Table ES-3 below. Rather than looking backward at Arizona's colorful past in copper mining for sources of economic vitality, public economic policy should be analyzing the powerful economic forces that have been creating these tens of thousands of new jobs year after year.

Table ES-3.

Job Creation in Arizona 1990-2011		
Industry	Average Jobs Created Each Year 1990-2011 in Arizona	Average Pay Per Job 2011
Health Care	9,485	$58,089
Government: Local, State, Federal	6,325	$66,602
Professional, Scientific, & Technical Services	5,370	$62,656
Finance & Insurance	5,158	$53,889
Other Services	3,552	$59,869
Construction	2,397	$56,115
Transportation	2,013	$55,545
Wholesale Trade	1,778	$78,008
Total of Above: Growing, Well-Paid Jobs	36,077	$61,383
All Wage & Salary Jobs	43,738	$57,327
Source: U.S. BEA REIS		

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I. Introduction: Evaluating the Economic Impacts of the Proposed Resolution Mine, Superior, Arizona

The Resolution Copper Company (Resolution) is exploring a large porphyry copper ore body about four miles east of the Town of Superior, Arizona. Resolution has described this ore body as one of the great copper ore discoveries in the last 100 years and has proposed to build one of the largest underground copper mines in the world to extract that ore.[2] The map below shows the approximate location of the proposed Resolution Copper Mine.

The planning and design of the mine are still in the pre-feasibility stage, although Resolution has already invested $800 million in the project and until late 2012 had about 500 people working on exploration and development at the site. Resolution expects to invest more than $5 billion in this project before full production is reached in the early 2020s. The mine is then projected to operate for a fifty-year period.

[2] http://resolutioncopper.com/the-project/

The Resolution Copper Project is a joint venture of two of the largest mining companies in the world: Rio Tinto (United Kingdom) and BHP Billiton, Ltd. (Australia). In order to quantify the expected economic impacts associated with that proposed mine, Resolution hired Elliott D. Pollack & Company (Pollack). Pollack prepared a report for Resolution Copper Company titled "Resolution Copper Company Economic and Fiscal Impact Report, Superior, Arizona" [3] (Pollack Report). Resolution has made wide use of that report in its presentation of the public benefits Resolution projects will flow from the proposed mine if it is successfully permitted and reaches planned production.

This study is an analysis of the methods used in the Pollack Report, the impacts measured, and the interpretation of those impacts. This study is organized in the following way. First we explore the promise of additional copper mining in Arizona as seen by the Pollack Report by summarizing the large and extensive positive impacts that the Pollack Report projects. We then look at the actual past economic impacts associated with past and present copper mining in Arizona and mining, generally, across the United States. That survey of actual past experience with metal mining conflicts with the Pollack Report's projections of enhanced and sustained prosperity in the Greater Superior Area and the State of Arizona as a result of the construction and operation of the Resolution Mine.

We, therefore, turn to an exploration of what we call the "anomaly of mining," limited economic development, economic stagnation and decline, high unemployment and poverty rates, despite the tremendous mineral wealth extracted and high wages paid by metal mines. It is important to understand why the projected future of sustained prosperity claimed for new metal mines is **not** what metal mines have produced in the past.

This exploration of the limited contribution that past metal mining has made to sustained prosperity in Arizona and elsewhere in the United States, leads us to question the very large positive impacts that the Pollack Report projects. We therefore explore the way Pollack derived those large positive impacts. We find that Pollack designed its analysis to focus only on benefits, systematically excluding any analysis or discussion of costs. It is unusual to design an *economic* analysis that considers only pure benefits. Economics as a social science weighs both costs and benefits.

The Pollack Report took a *statewide* look at the expected impacts associated with the proposed Resolution Mine. Although this allows the estimation of larger economic impacts, such a statewide view does not indicate what communities, governments, and residents of the local area around the proposed mine will experience. We therefore used the same economic modeling tools that the Pollack Report used to quantify the impacts that are likely to be felt in a local study area that we define as the area and towns in the vicinity of the proposed mine. We find much smaller impacts. We contrast our estimated local impacts with the Pollack Report's estimated statewide impacts. We

[3] September 2011, http://resolutioncopper.com/wp-content/uploads/2012/08/Economic-and-Fiscal-Impact-Survey.pdf .

also explore a variety of steps that were taken by the Pollack Report to exaggerate their projected positive benefits.

II. The Promise Associated with Additional Copper Mining in Arizona

A major mining project is almost always presented by the mineral developer and perceived by local and state governments and the business community as "an offer that is too good to refuse" because mining offers access to needed minerals, the production of new wealth, and high wages for local workers. We begin with a discussion of those positive economic aspects of mining and then turn to some of the often-ignored negative economic characteristics of mining.

Because mineral extraction involves removing valuable minerals from the earth, a capturing of a "gift of nature," it is commonly perceived to involve the "production" of substantial wealth. In both our history and folklore, mineral exploration, when successful, has been seen as discovering substantial "treasures." The mining of precious metals, gold and silver, provide some of the most colorful examples from our history. In fact, some of the first Europeans to explore what is now Arizona and New Mexico were searching for the "Seven Golden Cities of Cibola." The Coronado National Forest in Arizona is named after the most famous of those early treasure seekers.

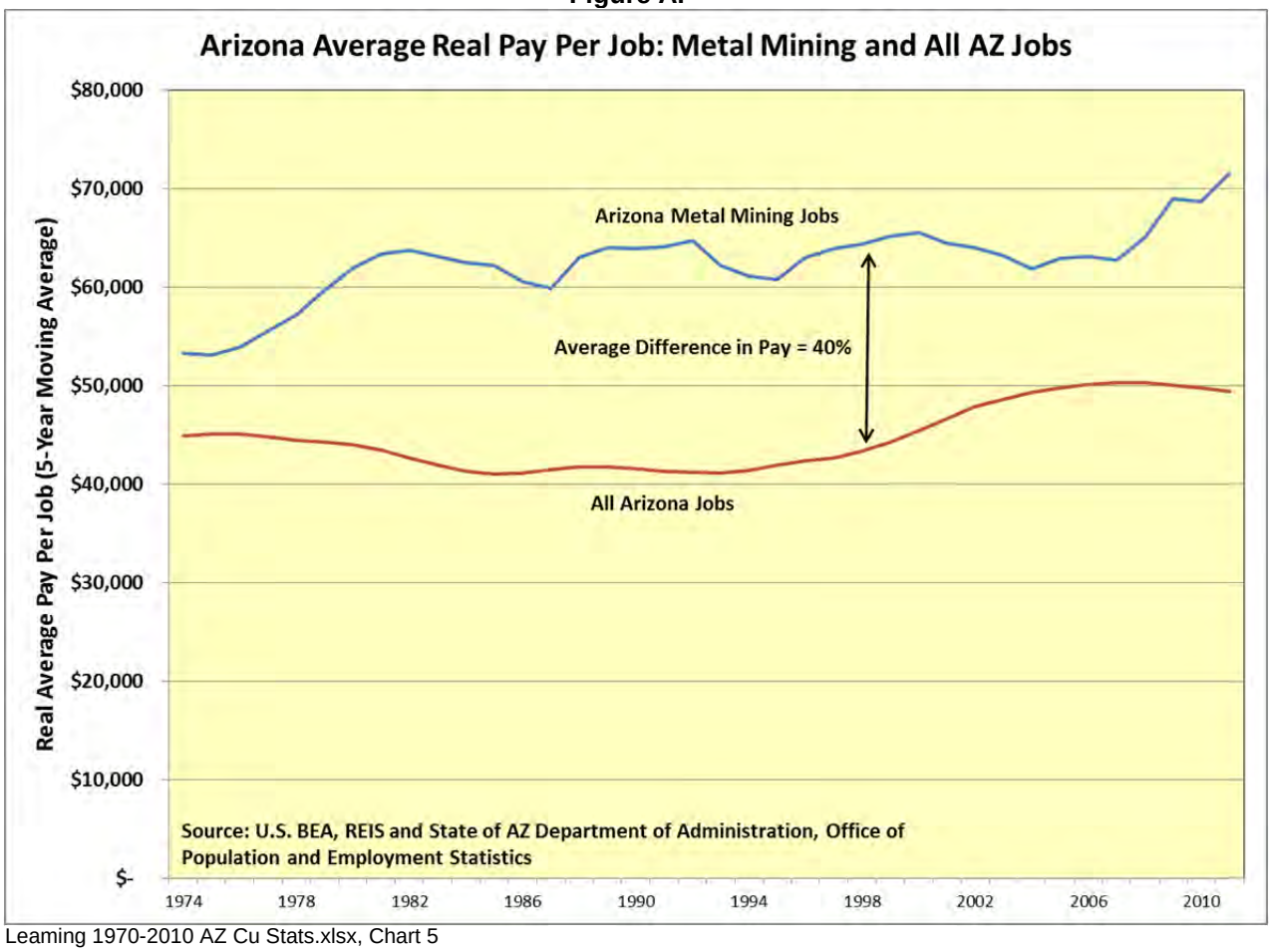
It is not just the development of precious metals that can generate considerable wealth. The copper mining city of Butte, Montana, was referred to as "the richest hill on Earth" in the early 20th century. The discovery of oil fields and later natural gas fields were also the source of personal fortunes and substantial corporate profits. Coal, iron, lead, and other mineral discoveries transformed regions while generating considerable income. This view of our economic history has led to a common association of almost any mining project with the extraction of "treasure" and the production of considerable wealth, some of which is expected to benefit both workers and local residents.

1. High Wage Jobs

Mineral extraction activities pay among the highest wages available to blue- collar workers. In Arizona between 2007 and 2011, metal mining jobs paid about $70,000 per year while the average job in Arizona paid about $50,000, almost 30 percent lower. Since 1970 metal mining jobs, on average, have paid 40 percent more than the average Arizona job.[4] See Figure A. These high levels of mining pay in Arizona are consistent with the pattern across most of the nation.

[4] U.S. Bureau of Economic Analysis, REIS data base: earning by place of work and total employment as well as metal mining earnings and employment (1970-2000). Arizona Department of Administration, Office of Population and Employment Statistics (2001-2011)

Figure A.



Leaming 1970-2010 AZ Cu Stats.xlsx, Chart 5

The Pollack Report estimated that the Resolution mining jobs would pay $75,000 per year, including benefits, in 2011 dollars.[5] That is consistent with Figure A.

The Pollack Report projects that on average there will be 1,400 of these high paid jobs directly created by the Resolution Copper Mine over each of the 64 years of development, production, and reclamation. When the "ripple effects" associated with the mine's purchase of supplies and workers spending their earnings are taken into account, the Pollack Report projects that an average of 3,700 new jobs will be created, lasting 64 years. (p. 7, Table 5)

The *promise* of additional copper mining in Arizona is that this higher pay will not only bring prosperity to households that have a member engaged in mining, but also that, as those mining families spend their income, it will circulate through local businesses putting even more people to work. In that way, economic development and prosperity will extend throughout the communities near the mine.

[5] Page 7, direct wages divided by the direct jobs.

2. Billions of Dollars of Production

The Pollack Report also projects that the Resolution Copper Mine will directly produce $41 billion in economic output over the life of the mining project. When the indirect and induced impacts associated with the purchase of supplies and the spending associated with the new jobs is taken into account over $61 billion in new economic output will be created. (Page 8, Table 6)

3. Tax Revenues to Governments

The Pollack Report estimates that as a result of the building, operation, and closing of the mine, the total tax payments to the federal, state, county, and municipal governments, when direct, indirect, and induced effects are taken into account, will total almost $20 billion. (P. 20, Table 16)

These cumulative impacts on the local, county, state, and national economies that the Pollack Report estimates provides a typical example of the promise of overwhelming economic benefits that mining companies project will flow from the development of a new copper mine. Treasure, wealth, high wages, jobs, and large flows of revenues to governments are the explicit *promise* associated with large new metal mines.

It is puzzling, therefore, to look across history and geography for signs of the ongoing prosperity that has always been projected to follow mining. Whether one looks closely at Arizona or other mining regions across the United States or around the world, it is usually difficult to find evidence that the projected sustained prosperity was actually realized. We turn next to that historical experience with mining.

III. The Reality of Copper Mining in Arizona

1. Pollack's Projection of How Resolution's Mine Will Bring Prosperity to the Local Economy

The Pollack Report acknowledges that past mining in the Superior-Miami-Globe region has **not** led to sustained prosperity: "The economic prosperity of many mining communities has followed a boom and bust cycle related to the opening and closing of their mines." The Pollack Report asserts that "Resolution Copper Company has signaled a commitment to ending this boom/bust cycle in Superior." (p. 15) This appears to be an admission that across the history of copper mining in Arizona, copper mining did **not** deliver sustained prosperity, but, for some reason, "this time will be different" with the proposed Resolution Copper Mine. For this assertion to be more than just wishful thinking, Resolution Copper should produce evidence as to why this time will, in

fact, be different from Arizona's historical experience with copper mining and the nation's experience with most types of mining.

Instead of evidence, the Pollack Report primarily provides inspirational assertions:

> "Ultimately, the Resolution Copper Project can signify an economic turning point from a regional economy's perspective by jump starting job creation and investing heavily in the region. From the State's perspective, it would bring in yet another promising, long-term development to help catalyze Arizona's economic recovery and sustain its long term prosperity." (p. 21)

> "Once the Resolution Copper mining operations commence, the period of high employment stemming from direct company hiring and the increased demand for mining support services may last more than 50 years. During this extended period, with an increased focus on creating a sustainable diverse economy for not only Superior, but the region as a whole, the boom times would not be taken for granted and the long-term goals would be more attainable than ever." (p. 19)

> "Until other industries emerge, mining will be the most influential economic driver for the region. This will likely be the case for many decades. Fortunately, the estimated mine life for this project is approximately 50 years. The driving economic influence of the mine over this extended time period would provide enough time to allow the Town of Superior and surrounding communities to advance their economic efforts." (p. 18)

What is missing from all of these statements and the entirety of the Pollack Report is any indication of why copper mining in Arizona in the past did not also trigger the ongoing economic development and sustained prosperity that Resolution now wishfully projects.

These statements in the Pollack Report confirm several past economic problems associated with the reliance of Arizona, in general, and of Pinal and Gila Counties, in particular, on copper mining:

i. Copper mining has been an unstable source of employment and income.
ii. The communities that developed alongside the copper mines were not diversified, contributing to their instability.
iii. Communities should avoid repeating this pattern.

Yet the Pollack Report offers no strategy to the region for avoiding these problems. Instead, after pointing out the problems of an undiversified mining economy, it recommends "more of the same" by adding another copper mine instead of indicating how the boom/bust cycle could be avoided this time, it simply asserts that this time "the boom times would not be taken for granted…." The only factual characteristic of the Resolution project that the Pollack Report mentions to support its "this time will be

different" assertion is Resolution's projected 50-year supply of copper ore for the operating mine. We will discuss below the limited contribution that such long-run projected mine ore supplies can make to the future stability of mine-dependent communities.

2. Arizona's Long History of Copper Mining

Arizona became an important supplier of copper to the nation in the last quarter of the nineteenth century. Many of the original mining districts developed then continue to be mined today: These areas include the Morenci in Greenlee County, the Globe-Miami district in Gila County, the Green Valley operations in Pima County, and the Bisbee Area in Cochise County. Many other copper mines have been developed during the twentieth century and into the beginning of the twenty-first century.

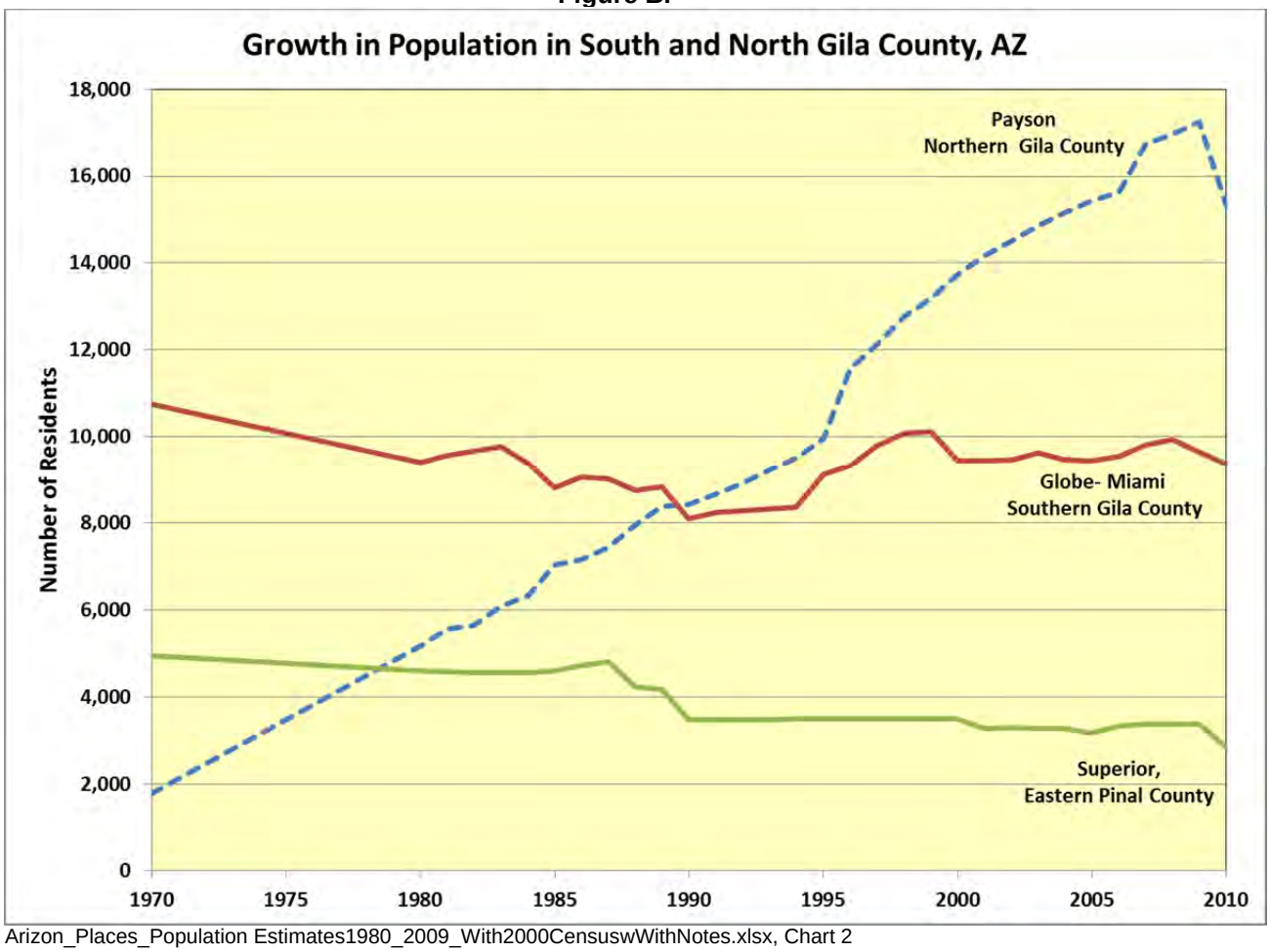
Because of this long history and experience with copper mining in Arizona, one need not speculate about the impact of that mining on the sustained prosperity of the communities associated with those mines. As the Pollack Report points out, this experience has not been one of pure benefit and sustained prosperity. The Pollack Report identified the boom/bust nature of the industry and the fact that often when the copper mining ceased, the adjacent communities declined, sometimes becoming "ghost towns":

> The ghost towns of the Old West further illustrate the importance of base industries. Once a local mine ran out, a railhead moved, or a drought caused agriculture to no longer to be viable, many communities ceased to exist. (p. 18)

Even when mining continued, the mining towns experienced little or no growth and their commercial infrastructure remained limited with very little additional investment taking place in the communities. Globe, for instance, the county seat of Gila County, has seen no population growth over the last century of mining. Between 1910 and 2010 its population fluctuated between 6,000 and 7,000. All of the mining and its accompanying high wages, high levels of mine company spending, and high value of copper removed from the area did not trigger ongoing economic vitality for the area.

Interestingly, in northern Gila County, in the Payson area, which was never a significant mining area, population has been growing dramatically. In 1970 only about 1,800 people resided in Payson. By 1980 population had almost tripled to 5,200. By 2010 it had almost tripled again to 15,300. Meanwhile, in the center of Gila County's copper mining, Globe-Miami, population has been largely constant. In Superior, another mining town just to the west in Pinal County, population has declined from about 5,000 to 3,000 between 1970 and 2010. See Figure B below.

Figure B.



Arizon_Places_Population Estimates1980_2009_With2000CensuswWithNotes.xlsx, Chart 2

The Southern Gila County Economic Development Corporation explained some of the difficulty in diversifying the Globe-Miami area economy:

> At that time, several small manufacturing companies had looked at our area, and after their evaluation, had decided not to locate here. When asked why, their feedback was that while they could get much labor, there were some positions that they would have to hire from outside the area. Turned out they were concerned that they wouldn't be able to attract quality people because of things like schools, doctors, parks, libraries, housing, etc. Also turned out Globe-Miami is ugly. Based on this feedback the [Southern Gila County Economic Development Corporation] decided to try to improve those areas and these "quality of life" groups were formed to make southern Gila County more appealing.[6]

[6] Arizona *Silver Belt*, June 30, 2010, Ted Lake, reprinted in Globe Miami Times, August 19, 2010, in *Business, Let's Talk.*

Payson in northern Gila County has also realized the importance of maintaining a high quality living environment if economic vitality is to be maintained and enhanced. In its Vision Statement for its General Plan, this is how Payson describe itself and its future:

> Payson is a vibrant recreation destination amidst the tall pines and cool waters of Arizona's Rim Country. Renowned for its western heritage and friendly people, the Town is a safe and sustainable community that embraces education, culture and economic prosperity through quality development.[7]

In considering the role that a further commitment of the Superior-Miami-Globe area to continuing its reliance on copper mining to enhance its future economic vitality and the creation and sustaining of prosperity, it is important to focus on why copper mining has not resulted in attaining these economic goals after over a century of effort and why, in the face of a century of lessons to the contrary, it is reasonable to believe that metal mining will do so in the future?

To try to answer those questions, we first look at the experience of other mining areas in the United States and around the world. Then we look in detail at what it is that has often kept mining from being a source of sustained economic vitality and prosperity.

IV. The Anomaly of Mining: High Pay and Valuable Treasure but Little Prosperity

Given the high wages associated with mining, one would expect communities that rely on mining to be unusually prosperous. That, in general, is not the case. Across the United States mining communities, instead, are noted for high levels of unemployment, slow rates of growth of income and employment, high poverty rates, and stagnant or declining populations. In fact, several of the nation's historic mining regions have become synonymous with persistent poverty, not prosperity: Appalachia (coal), the Ozarks (lead), the Four Corners (coal), and the Upper Peninsula of Michigan (copper and iron) are the most prominent of these.[8]

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[7] Payson General Plan Update 2014-2024, May 28, 2013, p. 12. http://www.paysonaz.gov/Departments/CommunityDev/General-Plan/Documents/Draft.GP.2014-2024rev5-28-13.pdf

[8] Outside of the rural US Deep South where a long history of racial inequality has led to persistent poverty, mining and other natural resource counties are prominent among the persistently poor non-metropolitan counties. **"**Mining the Data: Analyzing the Economic Implications of Mining for Non-metropolitan Regions," William R. Freudenburg and Lisa J. Wilson, ***Sociological Inquiry***, 72(4), Fall 2002. Also the Revised ERS County Typology: An Overview, 1994, Peggy J. Cook and Karen L. Mizer, Economic Research Service, Rural Development Research Report Number 89, U.S. Department of Agriculture. Compare the mining counties with the persistent poverty counties, pp. 8 and 24.

Federal efforts have focused considerable taxpayers' resources on overcoming the poverty and unemployment found in these historic mining districts. In addition, the copper towns of Arizona, New Mexico, Montana, and Michigan and the Iron Range in Minnesota, the Silver Valley of Idaho, the gold mining towns of Lead and Deadwood, South Dakota, the "Uranium Capital" of the nation in the Grants area of New Mexico and the Uravan Belt in western Colorado, etc. are also not prosperous, vital communities. Over the last several decades some of these areas have begun to recover either as a result of hundreds of millions of dollars of Super Fund expenditures aimed at cleaning up the environmental damage of mining and/or as a result of the in-migration of new, relatively foot-loose residents and economic activities, but that recovery is usually *not* tied to ongoing mining as is being proposed by Resolution in the Superior, AZ, area.

The dramatic contrast between the wealth created and the high wages paid in mining and the poor economic performance of mining communities needs to be understood before expanded mineral extraction activities can be safely promoted as a local economic development strategy. Below we take a brief look at the actual performance of mineral communities over the last thirty years and then turn to an explanation for that relatively poor economic performance.

In order to explore the local impact of reliance on mining in the United States over the last three decades, we look at the economic performance of all US counties where mining (excluding oil and gas extraction) was the source of 20 percent or more of labor earnings at some time in the 1980s. There are about 100 such counties that could be identified out of the 3,100 counties in the United States.[9] Data disclosure problems prevented the identification of some mine-dependent counties.[10]

These U.S. mining-dependent counties are spread out over half of the American states but are geographically clustered in the Appalachian (Pennsylvania, West Virginia, Tennessee, Kentucky, and Virginia) and Mountain West states. The century-old copper mines of Arizona, New Mexico, Montana, Utah, and Upper Michigan are included as are the new gold mines in Nevada. The older coal mines in the southern regions of the

[9] The Regional Economic Information System 1969-2000 CD-ROM (Bureau of Economic Analysis, US Department of Commerce) was the source of the data. A county was included as "mining-dependent" if the data indicated that for at least one year in the 1980-1989 period "mining" less "oil and gas" earnings were 20 percent or more of total earnings by place of work.

[10] If a few firms dominated local mining, federal regulations prevent the release of the mining data for that county. This is often a problem in any given year, but it is less of a problem when looking at 20 years of data since mining data often will be available for at least one of those years and thus qualify it as "mining-dependent." The number of counties that would have been labeled mining-dependent if it were not for these data disclosure restrictions is unknown. However, our analysis identified about the same number of mining-dependent counties as other studies, about 100 counties dependent on solid minerals and another hundred dependent on oil and gas extraction. Kenneth Deavers and David Brown in a 1985 study identified a total of 199 counties in these two categories (Natural Resource Dependence, Rural Development, and Rural Poverty, Economic Research Service, US Department of Agriculture. Rural Development Research Report No. 48). A 1994 study identified only 146 mining-dependent counties (including oil and gas counties) (Peggy Cook and Karen Mizer, The Revised ERS County Typology, Economic Research Service, Rural Development Research Report Number 89, US Department of Agriculture).

Great Lakes states (Illinois, Indiana, and Ohio) are included as are the new open pit coal mines of Wyoming, Montana, Utah, Colorado, and New Mexico. The lead mines of the Ozarks in Missouri, the precious metal mines in the Black Hills of South Dakota and the Silver Valley of Idaho, and the iron fields of Minnesota and Upper Michigan are also included.

The question we seek to answer is whether this high degree of reliance on mining allowed these counties to out-perform counties that did not specialize in mining. Economic performance was measured in terms of the ***growth*** in the total income received by residents, the aggregate labor earnings of residents of the county, per capita income, and population. In addition, the ***level*** of per capita income at the beginning and end of the periods was analyzed. We judge the relative economic performance of specialized mining communities by comparing them to counties that did not specialize in mining. We simply form a ratio of the growth in the mining counties and the growth in the non-mining counties. If this ratio, say, is 0.50, it means that the growth in the mining counties was only half that of the growth in non-mining counties.

The decade of the 1980s was not good for mining-dependent counties. Aggregate labor earnings in those counties grew much more slowly than in other counties, almost 60 percent slower. During the 1990s earnings were still growing more slowly in mining-dependent counties, 25 to 30 percent slower. In the 2001-2008 period[11], however, rising metal and coal prices led to a recovery of some mining counties after 20 years of depressed economic vitality. During that period, although mining counties saw much slower population growth, the earnings and per capita income of the residents of mining counties grew faster than in other counties for the first time in 20 years. Per capita income and residents' labor earnings grew 13 percent faster in mining-dependent counties while total income grew 9 percent faster. For the whole period of 1980-2008, despite the resurgence of mining activity in the most recent period, however, aggregate earnings and per capita income still grew significantly more slowly. Mining-dependent county earnings grew over a third slower, personal income almost a quarter slower, and population and per capita income about an eighth slower.

Given this poor economic performance in US mining-dependent counties despite the high wages paid by mining, it is not surprising to find that population growth in these counties was negative during the 1980s and significantly slower than in the rest of the nation in the 1990s. Population growth continued to be significantly slower during the 2001-2008 period too. See Table A below.

[11] In 2001 the U.S. Department of Commerce shifted is industrial categories from the Standard Industrial Classification to the North American Industrial Classification. Instead of reporting on total mining and the sub-categories of metal mining, coal mining, oil and gas, and other mining, it reported only on the sub-categories of "oil and gas extraction" and "mining except oil and gas." The 2000 and 2001 data cannot be directly compared, hence our use of the 2001-2008 period. For the 1980 to 2000 period we approximated the "mining except oil and gas" by subtracting "oil and gas" from total mining.

Table A.

Ratios of Growth in Economic Vitality Indicators Growth in Mining Dependent/Growth in Non-Mining Dependent				
	1980-1990	1990-2000	2001-2008	1980-2008
Personal Income	0.59	0.82	1.09	0.76
Population	-0.85	0.50	0.65	0.87
Per Capita Income	0.72	0.95	1.13	0.88
Earnings	0.41	0.69	1.13	0.64

Source: US Dept. Comm., BEA, REIS Local Area Income

This loss of population from mining areas when mines shut down or as long-lived mines adopt labor-displacing technologies is not surprising. After all, the cultural artifacts of past mining areas, the "ghost town," have been an important part of our history.

Despite the high wages paid in mining, the level (as opposed to the growth rate) of per capita income was also lower in the mining-dependent counties and, given the slower growth, the gap increased relative to the rest of the nation between 1980 and 2000. The gap grew to $9,500 per person by 2000. In 2008 there was still a gap in per capita incomes in the mining counties, but the gap had narrowed to about $3,000.[12] See Table B below.

Table B.

Level of Per Capita Income: Mining Dependent and Non-Mining Dependent Counties				
	1980	1990	2000	2008
Mining-Dependent	$8,390	$13,754	$20,099	$30,240
Non-Mining Dependent	$10,201	$19,622	$29,548	$33,191
Difference	-$1,811	-$5,868	-$9,449	-$2,951

Source: US Dept. Comm., BEA, REIS Local Area Income, and author's calculations.

A recent study of all U.S. non-metropolitan counties in the years 2000-2007 confirmed our results from the earlier periods. It found that increased dependence on mining was

[12] Most mining operations are located in non-metropolitan areas where average incomes, in general, are lower. If the mining-dependent counties are compared only to other non-metropolitan areas as opposed to *all* counties, both metropolitan and non-metropolitan, it is still true that the mining-dependent counties have lower per capita incomes and that they lost ground relative to other non-metropolitan counties during the 1980-2000 period. This is also true for most mining regions even if the mining-dependent counties are compared only with the other non-metropolitan counties within the same state. Of the 24 states with mining-dependent counties, only five (MT, MN, MI, GA, and SD) had per capita incomes above the state's non-metropolitan average in 1990 and per capita incomes in the mining communities within those five states were only 4 to 9 percent higher. In 2000 the per capita incomes of mining-dependent counties exceeded that of the state's non-metro areas in only three states. In 2008, despite the expansion of mining, 17 of the mining states still had non-metro per capita income above that in the mining-dependent counties. The average per capita income in the mining-dependent counties remained below the per capita income in the non-metropolitan areas for 1970, 1990, 2000, and 2008. In 1980 the per capita income in mining-dependent counties was 5 percent above the national non-metropolitan per capita income.

associated with slower population growth in the 2000 to 2007 period.[13] It also found that increased reliance on mining had no positive impact on employment growth. On the other hand, the more reliant a rural county was on mining in the 2000-2007 period, the *higher* the growth rate was in per capita income during that period.[14]

It is clear that over the last several decades, dependence on mining did not provide a reliable path to prosperity that allowed mining communities to perform better than other American communities. In fact, mining-dependent communities lagged significantly behind the average for the rest of the nation.

These are not new results. US Department of Agriculture analyses of mining-dependent counties have also pointed out the slower economic growth and lower per capita incomes in mining-dependent counties.[15] In addition, recent reports by the US Census Bureau providing *Profiles of Poor Counties* showed, when counties are classified by the type of industry that dominates the local area, mining counties had the highest poverty rates of any industrial group and that poverty rate increased systematically between 1989 and 1996.[16]

Unemployment is also higher in mining-dependent counties in the United States. For instance, unemployment rates in coal mining counties[17] are significantly above the average unemployment rate in the state where the county is located. Averaged over the 1990-2000 period and across all coal-mining counties, the unemployment rate in those counties was 55 percent above the state average rates. For some states such as Arizona and Virginia, the coal county unemployment rates are two to three times higher than the state unemployment rates. See Table C below. Given the ongoing job losses in most coal mining counties due largely to labor-displacing technological change, these high unemployment rates might be expected. During the 1980s, for instance, the layoff rate in the mining industry was the highest of all the major industrial groups in the US and the rate of job displacement in coal mining was much higher than in mining as a whole.[18] Coal mining and copper mining have followed similar technological paths, installing highly mechanized and automated systems that require fewer and fewer

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[13] Mining except oil and gas development was the industrial classification. That includes metal, coal, sand and gravel, and other non-metallic mineral mining.

[14] Deller, Steven C. and Andrew Schreiber. 2012. "Mining and Community Economic Growth," ***The Review of Regional Studies*****,** 42(2):121-141. Mining included all mineral extraction except for oil and gas exploration and development. Thus it included not only metal mining but also coal mining, sand, gravel, and rock production, and other mineral production such as phosphate, limestone, etc.

[15] See the studies cited in footnote 22 above.

[16] Profiles of Poor Counties: Some Empirical Evidence, Patrick Cardiff, US Census Bureau, Small Area Income and Poverty Estimates, FB3-1065, Washington, DC 20233, 1999. http://www.census.gov/hhes/www/saipe/asapaper/Cardiff99.pdf

[17] A US county was categorized as being a "coal mining county" if it had 200 or more coal miners in its work force. There were 99 such counties out of America's 3,100 counties. The Regional Economic Information System (US Bureau of Economic Analysis) was the source of the employment data; US Department of Labor the source of the unemployment data for the yeas 1990-2000.

[18] **"**The Industrial structure of job displacement, 1979-88," ***Monthly Labor Review***, September 1992, pp. 17-25.

workers. Some underground coal mining technologies like long-wall mining have been adapted to some deep underground copper mining operations.

Table C.

Ratio of the Unemployment Rates in US Coal Counties to the Statewide Average Unemployment Rate, 1990-2000								
AL	AZ	CO	IL	IN	KY	MT	NM	ND
1.05	2.64	1.31	1.50	1.38	1.64	1.76	1.38	1.82
OH	PA	TX	UT	VA	WV	WY	All US Coal Counties	
1.75	1.44	1.23	1.73	2.95	1.27	1.02	1.55	

Source: US Department of Labor; author's calculations

The important point to be drawn from all of these statistical results is that these mining activities, in general, have not triggered sustained growth and development in the local regions were the mining took place. Closure of mines in the late 19th and the first half of the 20th centuries often led to "ghost towns" and abandonment of a mining region. Where mining persisted over longer periods, it did not trigger a diversification of the economy. Instead, as labor saving technologies reduced employment opportunities, the region around the mines became distressed with high unemployment and poverty rates.[19] As mining again began to expand in the 2001-2008 period, counties that depended on mining made up some of the losses over the previous twenty years, but still lagged behind other counties that were not mining-dependent and remained vulnerable to downturns in the copper mining industry such as happened in 1996-2003 and 2008-2009 in Arizona.

V. Explanations for the Poor Economic Performance of Mining Communities

There are six important explanations for the poor economic performance of mining communities despite the high wages paid in those industries:

[19] A 2002 review of the literature dealing with the economic characteristics of mining-dependent rural communities in the US confirms these results. Of the 301 quantitative economic findings in scholarly studies about how mining-dependent communities fared relative to other communities, there were almost two (1.9) negative impacts reported for every positive finding. See **"**Mining the Data: Analyzing the Economic Implications of Mining for Non-metropolitan Regions," William R. Freudenburg and Lisa J. Wilson, ***Sociological Inquiry*** 72(4):549-75. "Rural" is used loosely here to refer to non-metropolitan areas that can have urban areas with populations of up to 50,000.

1. The instability of mine production, employment, and payroll.

2. The impact of ongoing labor-displacing technological change that constantly reduces the workforce requires for any given level of mine production.

3. Mines, ultimately, always deplete their economically viable ore deposits and shut down. The average life of a metal mine has declined significantly in recent decades. For instance, the copper mining activities in Butte, Montana, have lasted 125 years, albeit, employing a drastically reduced workforce. The mining activity in the Superior-Globe-Miami area, where the Resolution Copper Mine is proposed, has also been mining and processing copper ore for over a century. But different copper mines and ore processing facilities have opened and closed during that time period.

4. Mining usually takes place in rural, relatively isolated, areas. Rural areas, by definition do not have large trade centers that manufacture the equipment and supplies that technologically sophisticated mining operations need. They also cannot provide workers and their families with many of the provisions associated with life in the early 21st century. All of these provisions have to come from large metropolitan areas some distance from the mining operation. This leads much of the spending associated with the operation of the mine, including payroll, to leak relatively rapidly from the small town and rural areas where the mine is likely to be located.

5. Mine employees are very mobile, commuting long distance to work while maintaining their residences outside of the area immediately impacted by the mining and milling. This leads much of the mining payroll to "leak" out of the region immediately around the mine.

6. Mining is land intensive and as a result can have nearly permanent impacts on the natural environment. Environmental degradation can significantly reduce the attractiveness of a mining area as a place to live, work, and raise a family.

We discuss each of these in turn below.

1. Riding the Copper Mining Roller Coaster in Arizona

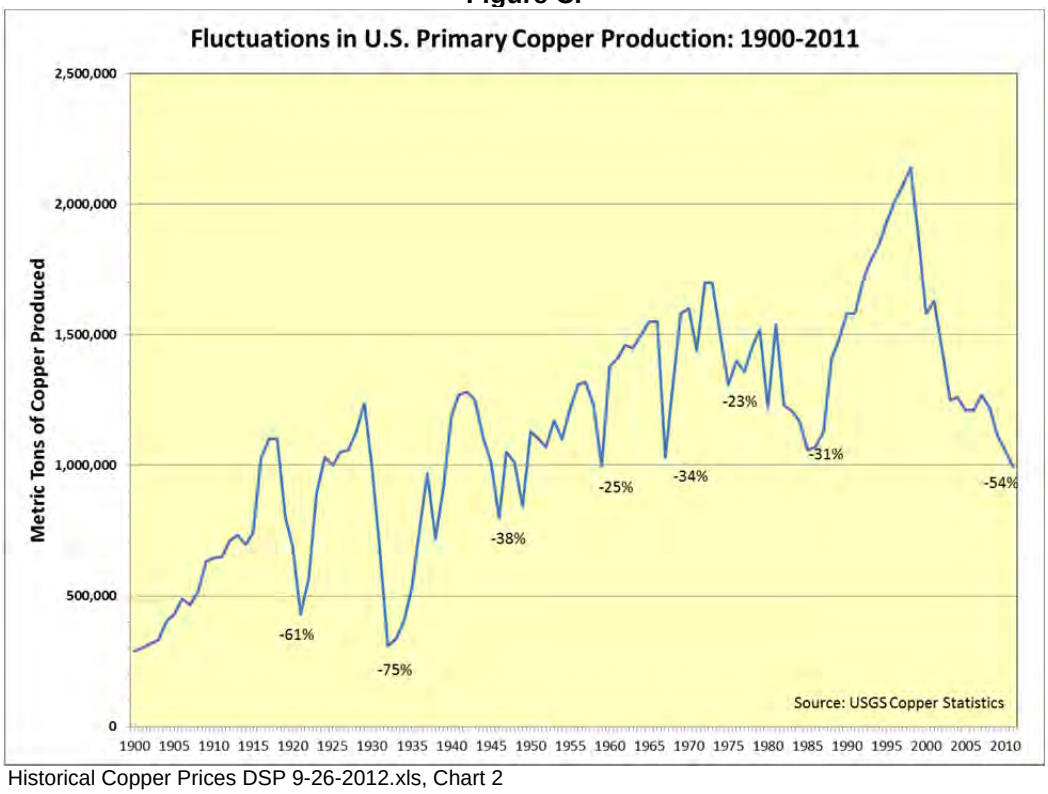
A. The Past Performance of Arizona's Copper Industry

One important explanation for the poor economic performance of local economies specializing in metal mining despite the very high wage characteristics of that industry is

the instability of employment and income associated with mineral development activity. The experience of Arizona with copper mining dramatizes this.

Arizona has had over a century of economic history with copper mining, concentrating, smelting, and refining. During that time, the demands for American copper ore and metal have constantly fluctuated. Over the last 110 years one can count at least eight major booms followed by busts in which copper production fell by as much as 75 percent and most recently fell by more than half at 54 percent between 1998-2011. Those busts almost always involved declines in copper production of a quarter to a third or more. See Figure C below. With those declines in copper production, of course, came declines in employment, payrolls, mine purchases, and payments of state and local taxes.

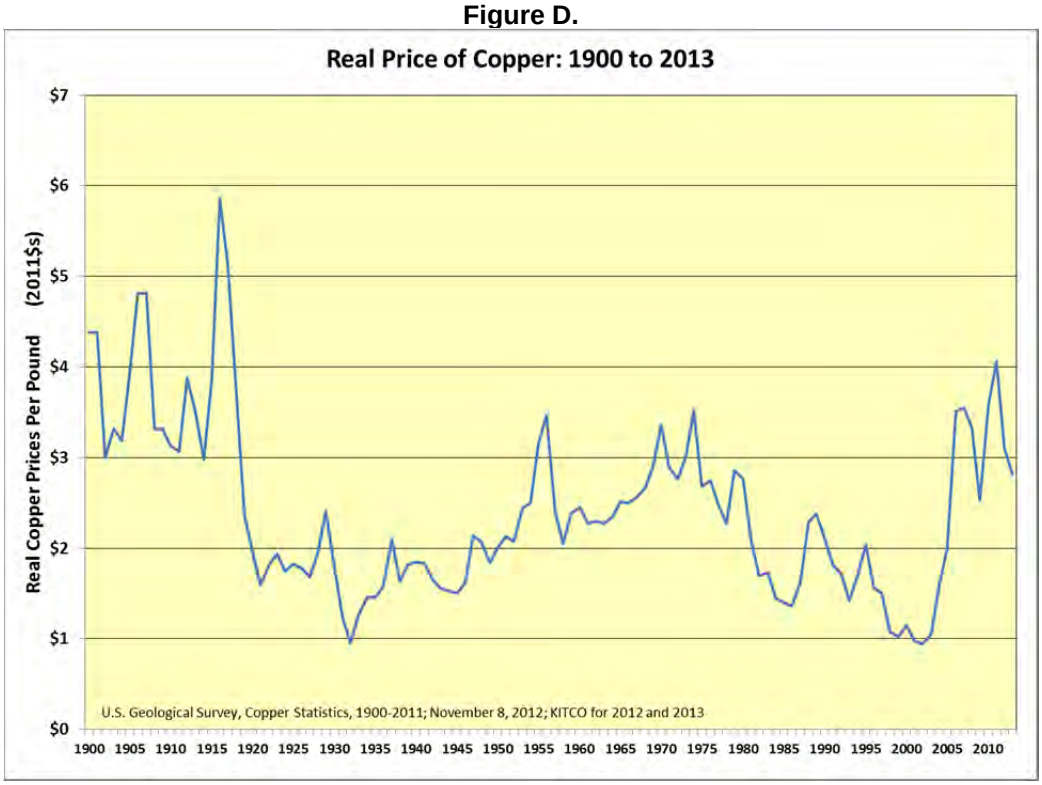
Figure C.



Historical Copper Prices DSP 9-26-2012.xls, Chart 2

The source of these declines in American copper production was not primarily the opening and closing of new mines. Rather, it was the constant fluctuation in the price of copper that regularly changed the profitability of operating copper mines, concentrators, smelters, and refineries. See Figure D below.

Figure D.



Cu Production and Price USGS 1900-2012 5-2013, Chart 1

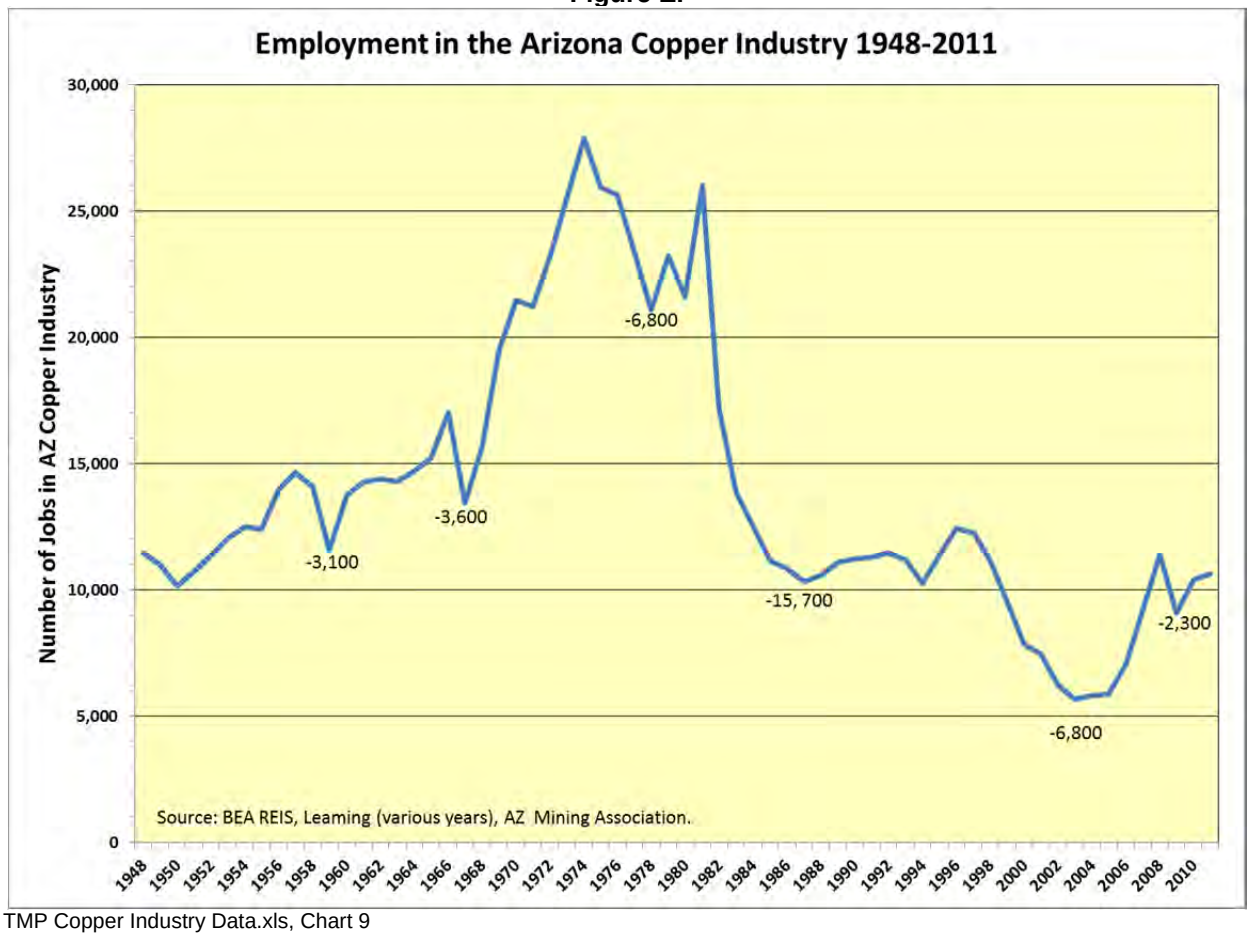
Copper, like most commodities sold on national or international markets, suffers through irregular but repeated cycles. When international demand for copper rises, prices will move upward motivating existing mines to increase their production to take advantage of the now more profitable market. In addition, the expanding international demand will lead new mines to be built that will add to the overall level of worldwide production sold into international markets. At some point, the increase in supply exceeds the overall level of demand, and the over-supply on the market begins to drive copper prices down. As a result production from some sources becomes unprofitable at the new lower prices and international copper production is scaled back, at first modestly. Then as copper prices continue to tumble there are larger and larger reductions in production including the closing of higher costs mines, smelters, etc. Just as increases in supply tend to overshoot demand, decreases in supply ultimately also result in a supply inadequate to meet demand and copper prices begin to rise again. Such commodity production and price cycles are common to many national and international markets where lags in the adjustment in both supply and demand prevent markets from maintaining a stable equilibrium balance.

There is another economic force adding to the instability in metals production from American mining areas: conflicts between labor and management. During periods of tumbling demand when mines are laying off workers, unions do not have much bargaining power. It is an inopportune time to threaten to strike. As metal prices rise and mines and smelters begin rehiring workers to take advantage of the growing profitable opportunities, unions' bargaining position strengthens and the threat of a strike is both more plausible and more potentially damaging to the mine owners' bottom line. This can

lead to disruptions in copper production, employment, and payroll even during periods of rising copper prices. For instance, in July of 2005 ASARCO faced a strike during a period of steeply rising copper prices and a recovery of Arizona copper production. Ultimately about 1,500 ASARCO workers across North America and 750 workers at the Ray Mine and Hayden mill and smelter in Arizona went on strike. ASARCO was forced to reduce production as it operated with management and non-striking workers. The reduced level of production and revenues partially led to a Chapter 11 bankruptcy filing by ASARCO. The strike lasted into November 2005.

These repeated fluctuations in the demand for and price of copper leads to ongoing fluctuations in copper mine employment, payroll, supply and equipment purchases, and tax payments. Analysts have come to call this irregular but ongoing instability in the economic impact of metal mining on local communities a "flicker" effect. Arizona copper industry employment over the last sixty years dramatically demonstrates this volatility in copper industry employment. Employment regularly increases by 5,000 to 15,000 jobs and then tumbles downward in the same dramatic way. See Figure E below.

Figure E.



TMP Copper Industry Data.xls, Chart 9

Besides the constant "flicker" of employment in the copper industry, there has also been significant dramatic collapses in overall copper industry employment. In 1974 Arizona copper industry employment peaked at about 28,000 workers. By 2003 the number of

jobs had tumbled to 5,700, four out of five of the copper industry jobs had disappeared. In total, 22,000 copper industry jobs had disappeared. There was a recovery between 2003 and 2008 but then the "flicker" returned as employment dipped again in 2009, laying off 2,300 workers.

These repeated and substantial fluctuations in copper industry employment have an unavoidable negative impact on local communities and economies. Workers and their families do not know how long their jobs will last or how long the relatively high pay will circulate within the local economy. That discourages investments by miners in the areas around the mines as well as investments by other businesses in the local commercial infrastructure. Because tax payments by mining companies fluctuate with the price of copper and the level of copper production, state and local governments also do not know what tax base they can rely on when contemplating investments in public infrastructure. The result of that volatility in the revenues associated with copper mining is a hesitation across the board to investment in the local economy. That partially explains the relatively run down and depressed character of mining communities despite the high levels of pay in mining and the huge volume of wealth extracted from those mines.

Figure F shows the fluctuation in real copper industry payrolls in Arizona over the last 40 years. The difference between $1.6 billion in copper industry payrolls circulating in Arizona towns and cities and only $360 million, less than a quarter the previous level of copper industry payrolls, is substantial and disruptive. But smaller declines such as the 1996-2003 drop from an $883 million payroll to a $385 million payroll also significantly impacted local economies even through it was followed by an increase in real payroll from $385 to $810 million between 2003 and 2008 only to be followed another downward "flicker" after 2008.

These periodic booms and busts in copper production and employment have disruptive impacts on the communities in the vicinity of the copper mines that prevent the high wages associated with copper mining from having a reliable positive impact on local economic vitality and stability.

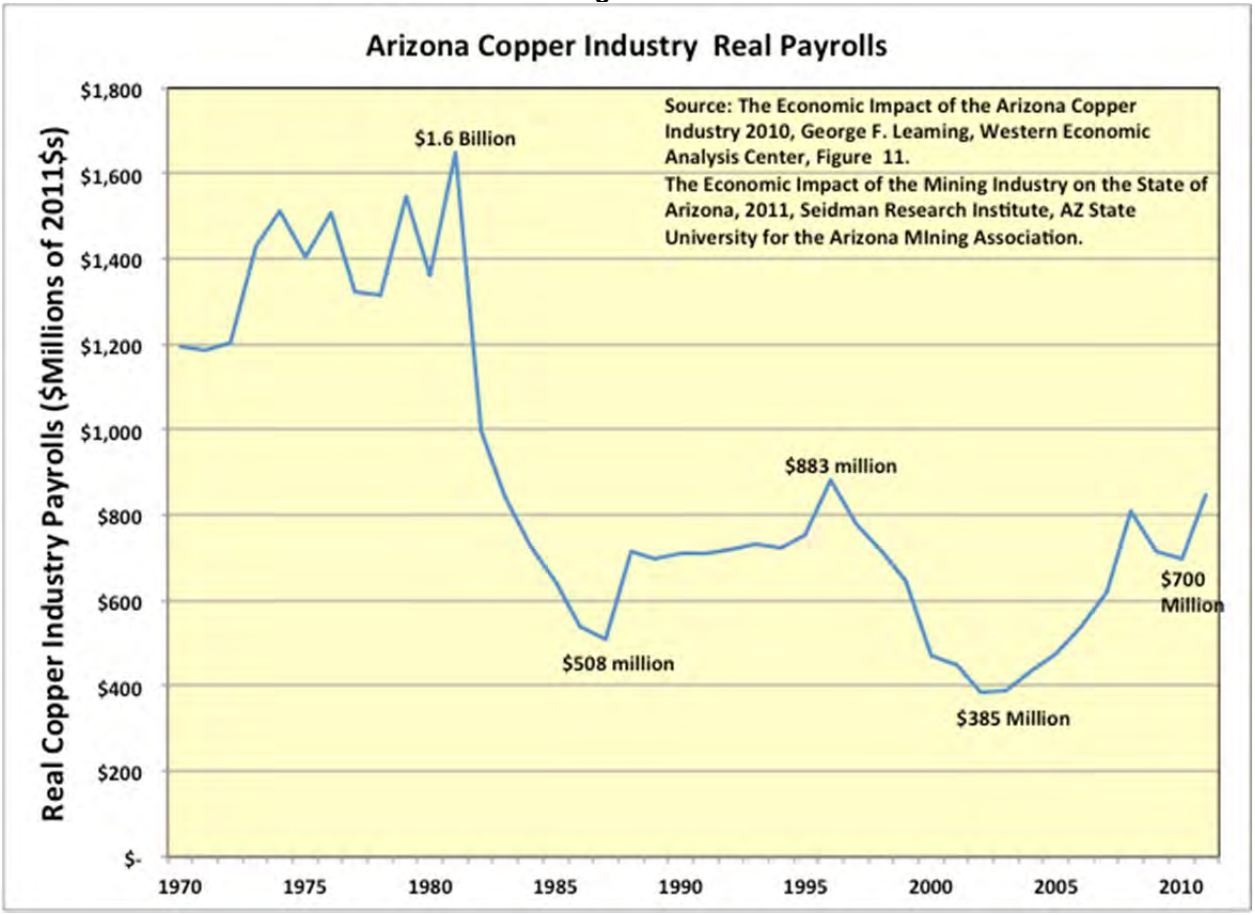
B. The Pollack Report's Projections of Stable Production and Employment

As discussed above, the Pollack Report projects that the proposed mine will have positive employment, payroll, mine spending, and government revenue impacts that will be largely stable over a 64-year period.[20] The Pollack Report talks about the high levels

[20] The Pollack Report *does* make clear that part of this assumed stability is assumed simply for ease of presentation of a project that it expects to span 64 years or more. It makes clear that the impacts during the planning, engineering, and construction phase of the first 14 years will be less than at peak construction and less than at peak production. In addition, it points out that as the mine approaches the end of its economic life, employment will decline as operations shift more towards reclamation activities. It is *not* this simplification of which we are critical. It is the failure to discuss the expected instability in employment, payroll, purchases, and tax payments due to the "flicker" effect associated with metal mining.

of employment and payroll that will be associated with the mine for 50 or 64 years: 1,400 jobs directly associated with the mine and another 1,750 jobs in businesses serving the mine and supplying the new workers and their families.[21]

Figure F.



Leaming 1970-2010 AZ Cu Stats.xlsx, Chart 2

The Pollack Report claims that "generations" of miners will benefit from the mine and that the stability of the employment that the mine brings to the area will lead families to move into towns like Superior and build new homes and businesses rather than commute to work in the Superior area from more distant locations. Pollack explicitly envisions that the mine will create "opportunities for stable employment [that will] continue for the next several decades."[22] It is that "stable employment" over "the next several decades" that will lead "employees [to] become vested in their place of work and also in the local community, as do suppliers of business inputs. Economic leakage is gradually reduced and a community realizes larger economic 'spin-off', or multiplier benefits." "Resolution Copper Company has signaled a commitment to ending this [past] boom/bust cycle in Superior."[23]

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[21] Pollack, p. 7.
[22] Pollack, p. 15.
[23] Ibid.

Yet, a shown above (Figure E), copper industry employment in Arizona has been anything but steady over the last 64 years. Every five to ten years the Arizona copper industry has moved dramatically up or down. Nothing in recent experience in Arizona would suggest that has ceased. Since 1994 there have been five significant movements, both up and down, in Arizona copper industry employment. See Figure E above.

This clearly indicates that simply specifying that there is a 50-year copper ore supply associated with a mine does not assure that the mine will operated uninterrupted at full employment for 50 years. That simply is not how copper mines operate. They have to pay attention to market conditions, to technological developments, to unexpected discoveries about the metal ore body being mined, to accidents and strikes, etc.

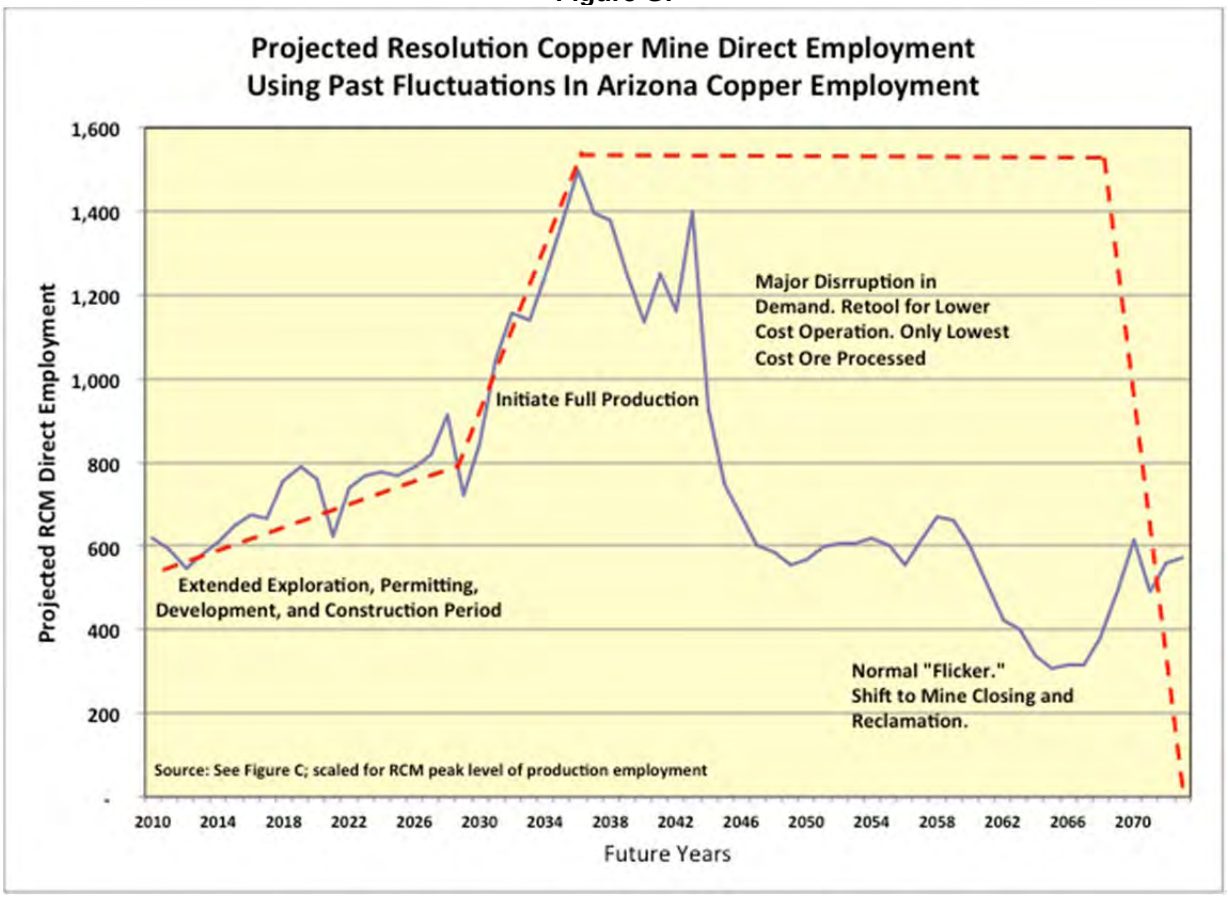
Also, as pointed out above, it is important to recognize that most of the instability in copper mining employment, payroll, mine purchases of supplies and equipment, and tax payments is not due to mines coming to the planned end of their economic life and shutting down. Much of the instability is tied to existing mines increasing and decreasing their level of production and employment due to changing market conditions, the retooling of the mining process with labor saving technology, strikes, and accidents.

In projecting likely economic impacts associated with a proposed copper mine, these fluctuations in production and employment need to be incorporated into the projection or a misleading impression of constant, stable employment will be provided.

One way to do that is to superimpose the past pattern of employment in Arizona copper employment on the Resolution projections of expected direct employment when the mine reaches full production levels. Resolution projects 14 years of developing the main shafts, continuing with the sampling of the ore body, developing the detailed engineering plans for the mine and ore processing and constructing the infrastructure to support the mine. Then the mine would operate for 50 years directly employing 1,400 to 1,500 workers. At the end of that 50-year period, the work would slowly shift from mining to reclamation as the mine systematically shuts down.

This is depicted in Figure G by the dashed red line. Also shown on Figure G as a solid blue line are the actual percentage fluctuations in Arizona copper mining employment between 1948 and 2011, now scaled to represent maximum Pollack Report production employment of 1,500 workers in 2036. This is a way of depicting what one might expect in terms of employment at the Resolution Copper Mine if it is buffeted by market and other economic conditions the way the copper industry was actually buffeted over the previous 64 years.

Figure G.



TMP Copper Industry Data.xls, Chart 11

The red dashed line more or less shows the basis for the Pollack Report's rosy projection of the Resolution Mine providing a stable basis of employment, payrolls, mine purchases, and tax payments: An increasing demand for workers over a 20-year period is followed by a 45-year period of steady employment of 1,500 workers. But that is not how mines in Arizona have operated over the last 64 years.

For instance, between 1997 and 2005 the contained copper produced in Arizona fell steadily from a peak of 1.4 million tons to 776,000 short tons, a loss of about half (45 percent) of the 1997 level of production. But this was not due to Arizona's copper mines running out of copper causing major mines to shut down permanently. Rather, after real copper prices per pound had fluctuated in the $1.50 to $2.00 per pound range between 1983 and 1995, real copper prices declined beginning in 1995 to $1.00 or less per pound during the 1998-2004 period. The result was a cut back in Arizona copper mining and processing as copper mining companies waited for prices to return to a profitable level. By 2006 copper prices were back above $2.00 per pound and Arizona copper producers began bringing their mines and copper ore processing facilities back to full production. The Great Recession in 2007-2009 caused an additional price stumble but copper prices stayed above $2.00 per pound.

Such copper price fluctuations can take place at any time, leading copper producers to scale back their operations until prices move back into a profitable range. Recall Figure C above that showed 110 years of copper price fluctuations with significant declines occurring, on average, every seven years or so. It is these fluctuations that have made copper mining an irregular source of support for local economies and discouraged private and public investments based on the fluctuating levels of employment, income, purchases, and tax payments. When, as in Figure E above, 60 percent of copper industry employment can be eliminated in a 6-year period (1981 to 1987) or 55 percent of copper industry jobs can again be eliminated in another 7-year period (1996-2003), the local economy suffers a significant loss and is disrupted in ways from which it cannot easily recover.

Just as the new jobs associated with a new copper mine can have a strong positive impact on the local economy, massive job losses have a strong negative impact on the local economy that has to be carefully considered too.

This is not “fearful speculation.” This is what has repeatedly happened in Arizona’s copper fields just as it has happened in the copper mining regions of New Mexico, Utah, Montana, and the Upper Peninsula of Michigan. This problem is also not a minor consequence; rather it is one of the reasons that areas dependent on mining are rarely prosperous. This fundamental aspect of mining has to be carefully considered when weighing the benefits and costs of committing a region’s future to metal mining.

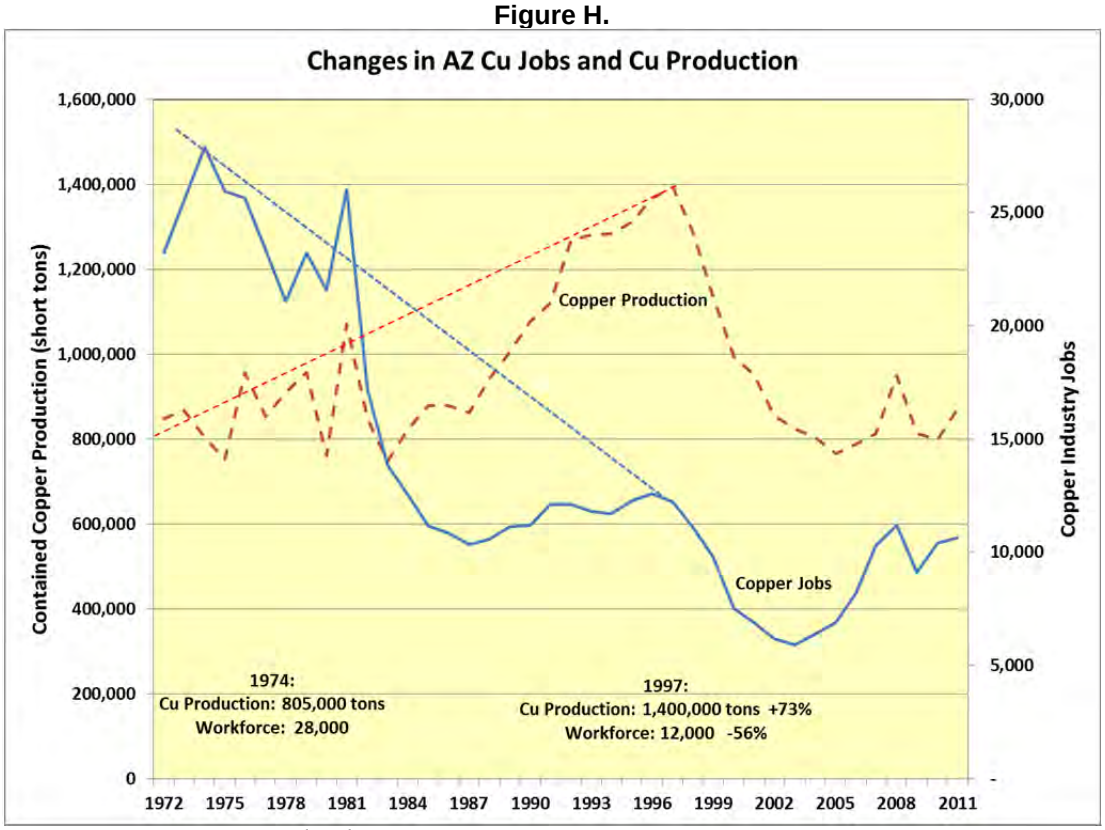
2. The Impact of Technological Change on Copper Mining Employment

It is interesting to note that substantial increases in copper production in Arizona have not always brought increased copper industry employment. In fact, between 1974 and 1997, when copper production increased by 73 percent, the copper industry workforce in Arizona was cut by more than half, 56 percent or about 16,000 jobs. See Figure H below.

This disturbing loss of copper industry jobs while copper production was expanding significantly was then followed by an equally strong collapse of copper production and another deep loss of copper jobs so that by 2003 copper industry employment was only about a quarter of what it had been in 1974.

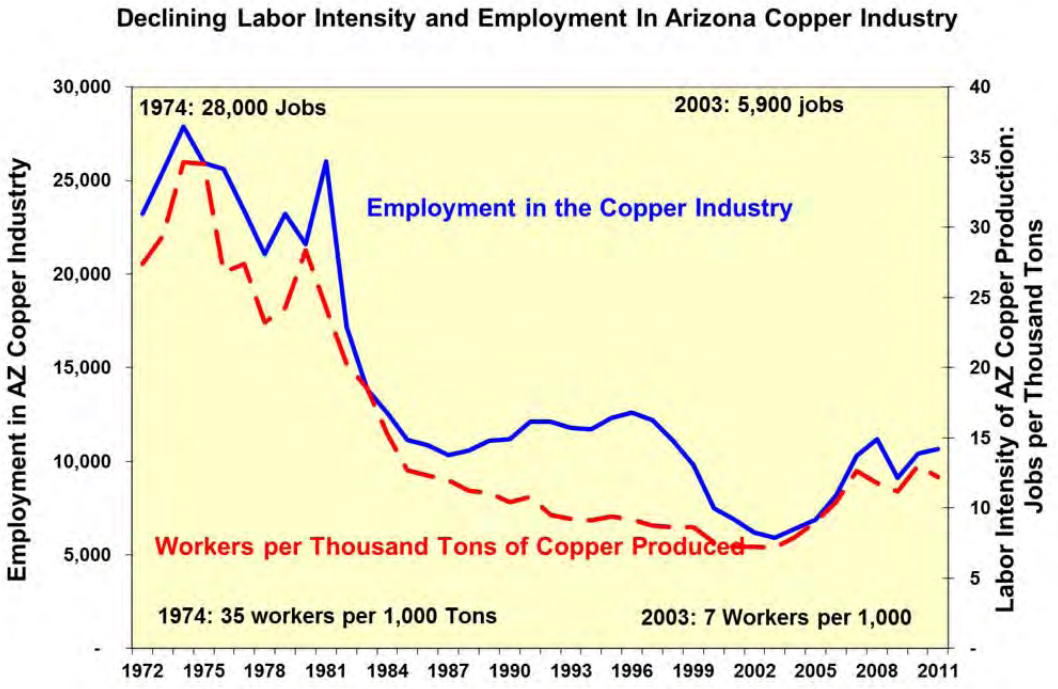
The collapse in employment during the boom in copper production during the last quarter of the 20th century was tied to rapid increases in labor productivity that decreased the labor needed to produce a thousand tons of copper. In 1974 it took about 35 workers to produce 1,000 tons of contained copper. In 2003 it took only 7 workers to produce this same quantity of copper. See Figure I.

Figure H.



Az Cu stats 1970-2011 5-2013.xlx, Chart 13

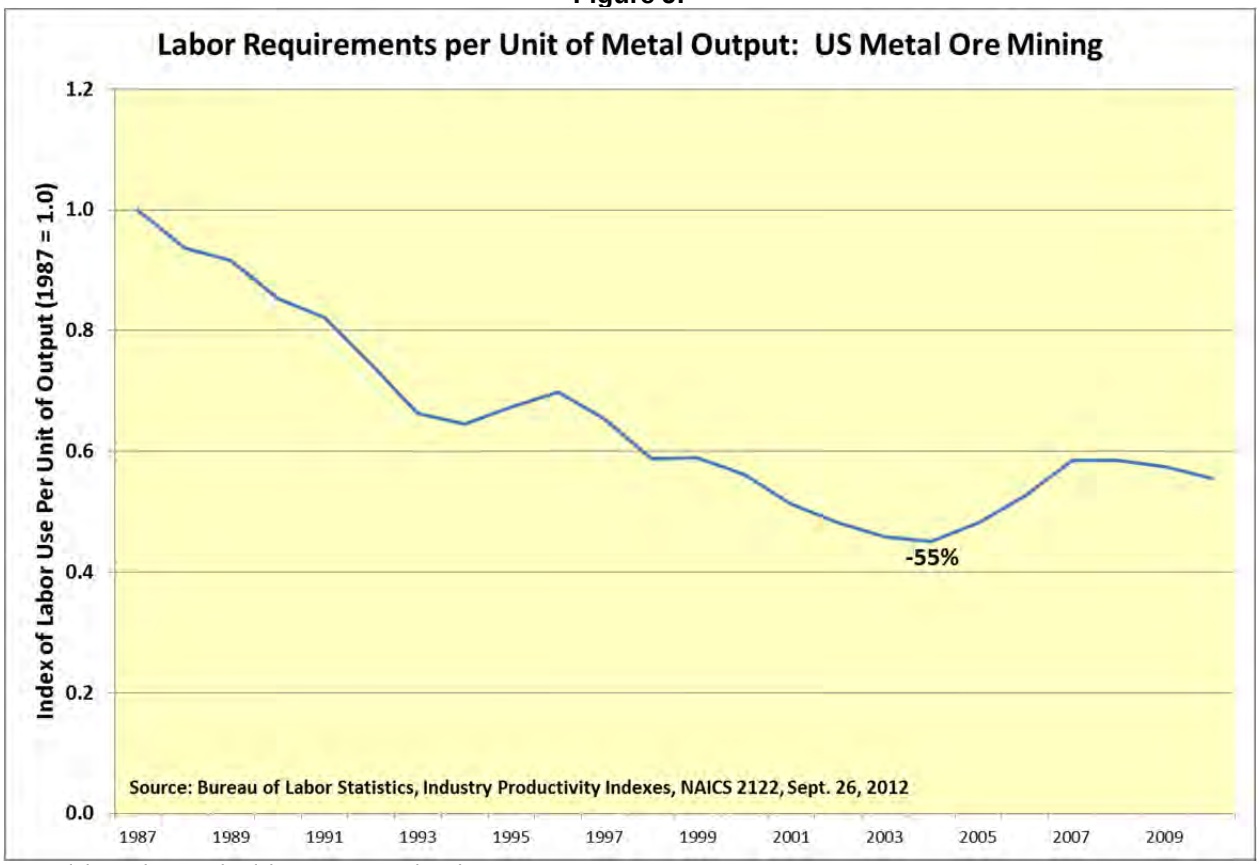
Figure I.



AzCuStats 1970-2011 5-13, AZ Labintens-jobs

This pattern of copper mining job loses despite expanded copper production was not unique to Arizona or to copper mining. Between 1987 and 2004 the workers per unit of metal produced fell by 55 percent across all metal mining. That is, in a seventeen year time period, the labor force needed to mine any given quantity of metal ore was more than cut in half. See Figure J.

Figure J.



BLS Mining Labor Productivity 1987-2007.xls, Chart 2

The shift to open pit mining from underground mining, the adoption of larger and larger ore shovels and haul trucks, the increased use of chemical extraction of copper from the ore, and other technological improvements made copper mining less and less labor intensive. Fewer and fewer workers were needed even when copper production was rising. This trend is likely to continue as is evidenced by Resolution's plan to use a highly mechanized and automated panel-caving technology in the proposed mine.

This labor-displacing technological change has helped copper mining companies control costs and remain competitive while processing lower and lower grade ores. The higher labor productivity also supports the high wages paid. The downside of this growth in labor productivity for workers and communities is that the labor required per unit of production has continued to fall, reducing the number of jobs associated with the industry. Thus even if production is stable, employment continuously falls. Only constantly expanding mineral development can maintain stable employment, and this is rarely possible over the long run in any particular area. A tiny part of the impact of

declining employment on payrolls in the copper industry between 1974 and 2003 was offset by increases in pay per remaining job. While employment in the Arizona copper industry fell by 79 percent, metal mining payroll declined by "only" 76 percent.

Copper mining is on the verge of another dramatic change in the technology used to extract the ore. Open pit mining in many locations is reaching the economic limits of what that technology can extract. The deeper the pit goes, the more over burden and waste rock has to be moved, the smaller is the amount of ore that can be extracted, and the higher and longer the haul is to get the ore and waste rock out of the pit.

At some point, despite the fact that the ore is as high a quality as that previously extracted, it is too costly to go deeper. This has led mining companies to explore a return to underground mining using techniques that have been used in the past but with technologies that have developed considerably over the last decade or so such as block- or panel-cave mining. This mining technique mines an ore body from below by digging rooms under the ore body and using gravity and the earth itself to move the fractured ore in a controlled way and guide it to automated haul vehicles. They carry it to conveyor systems, to underground grinders, and then to lifts and conveyor systems on the surface that remove the ore from the mine and move it to storage piles.

Resolution intends to use this technique. As mentioned above, it is not "new." It was used throughout Arizona's "copper triangle" during the first half of the 20th century.[24] At the Miami Mine, The Miami Copper Company began using block-caving techniques in 1925. By the time that underground mining at the Miami Mine was terminated in 1959, about 85 percent of the production had come from block-caving, a total of 131 million tons.[25]

The contemporary design of block and panel caving mines, as opposed to the techniques used in the early part of the 20th century, makes much more use of automated equipment including robotic trucks, trains, drilling, fracturing of the ore, conveyor systems, etc. The use of automated and robotic systems also allows much of the operation of the mine to be guided from remote locations.

There are several forces driving the move towards these automated and robotic mining systems. One is that the ore bodies being pursued are much deeper underground at or beyond heat levels that workers can tolerate for many hours a day. Safety concerns associated with underground mining are also an area of concern, especially in extreme conditions. But probably the most powerful driving force is the need to lower the overall cost of extracting the ore despite having to go deeper for that ore. Reducing labor costs is a key attraction for using robotics and automation.[26]

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[24] The U.S. Bureau of Mines published a report and map (Figure 2) on the use of the "block-caving method" in southeast Arizona in 1965. "Block-Caving Copper Mining Methods and Costs at the Miami Mine, Miami Copper Company, Gila County, ARIZ., W.R. Harwick, Information circular 8271. U.S. Department of the Interior.

[25] Ibid. p. 6.

[26] Fast Forward, ***Mining Magazine,*** Carly Lovejoy, June 2012, p. 68; Keeping up with Caving, Carly Lovejoy, ***Mining Magazine,*** June 2012, pp. 46-64.

This shift to high tech automated mining technologies is likely to reduce the number of jobs associated with the Resolution Mine and the number of those jobs that will be accessible to local workers. The jobs that are targeted for replacement with robotics are the ones currently filled by semi-skilled heavy equipment operators. Most vehicles will be controlled by computers and "handlers" in areas remote from the actual mine.

These new mines will not operate without workers. But they will operate with much more highly skilled workers who use computers to monitor and operate the equipment and maintenance people who have to be able to repair electronic equipment, automated machinery, and deal with the quirks of software programs and communication technology. The fact that many of these workers can operate from a mining company's central office rather than from the mine in a rural area is also likely to reduce the demand for workers from the local area where the mine is located. It is also likely to reduce the local opportunities to supply the mining operation with supplies and services as those become more specialized and technical.[27]

In the past, mining companies have sought to promise local residents, including Native Americans, that the mining company would operate training programs to assure that some of the jobs could go to local residents. The types of jobs for which the local workforce could be trained in a relatively short period of time, the entry level jobs, were largely those of heavy equipment operators and other material handlers. But these are exactly the types of jobs that the automation and robotics will eliminate.

As one analysis of these changes in the future metal mining workforce put it:[28]

> New roles in equipment maintenance, data processing, systems and process analysis, operational control and mine planning are likely to emerge. These new roles require different competencies, such as knowledge and skills in mathematics and science, and an aptitude for using information technology.

The training required for these new jobs is much more extensive. The competencies are also much more selective. They are not entry-level jobs.

The shifts in the technology of mining during the last quarter of the 20th century dramatically cut the employment opportunities in metal mining in the United States. That had very painful impacts on mining towns, impacts from which most mining towns have not recovered. For better or worse, technological change in metal mining has not halted. The new technologies being adopted by contemporary mines, including the proposed

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[27] "Exploring the social dimensions of autonomous and remote operation mining," K. McNab et al. Centre for Social Responsibility in Mining, The University of Queensland, Brisbane, Australia. 2013. Also see "Robotic technology could hobble prospects of mine workers," Owen Jacques, July 31, 2013***, Noosa News***. http://www.noosanews.com.au/news/robotic-technology-hobble-prospects-mine-workers/1965169/

[28] Ibid. K. McNab et al. p. vii.

Resolution Mine, will also reduce the positive impact that contemporary mines can have on the local communities near the mine.

3. Depletion of Mineral Deposits

As Resolution has pointed out, another potential source of fluctuating employment and earnings in mining is that mineral deposits are always, ultimately, exhausted, and the industry has to shift to new geographic areas. The Pollack Report pointed to this aspect of mining as the source of the past "boom and bust" character of copper mining in Arizona and elsewhere that has led to ghost towns (pp.15 and 17). Resolution projects that *its* proposed mine will have a projected life of 64 years, including the exploration, planning, and construction phase at the beginning and the mine wind-down and reclamation at the end of the mine's life. This, Pollack suggests, will stabilize employment, payroll, purchases, and tax revenues over a multi-generational period (p. 18).

As we have pointed out above, the exhaustion of economically viable copper ore deposits is only *one* of the sources of fluctuation in copper production, employment, payrolls, and associated impacts on the local economy. The "flicker" in copper mining activity due to copper market instability and ongoing labor-displacing technological change are two other quite different sources of "bust." But the ultimate economic depletion of copper resources *is* an important other source of instability.

The life of contemporary copper mining operations can be relatively short. The Carlota Mine in the Miami-Globe mining district began producing copper ore from its open pit operations at the end of 2008. The mine was expected to operate through 2020 (22 years). In actual operation the mine did not prove to be as profitable as expected and in mid-2013 it was scheduled for closure and reclamation after less than five years of operation.[29] Other copper mines or proposed copper mines outside of Arizona have had similar short lives. The Flambeau Mine in in Ladysmith, Wisconsin, operated for four years during 1993-1997.[30] The proposed Copperwood Mine in Michigan's western Upper Peninsula is projected to operate for 13 years.[31]

In contrast, the San Manuel Mine (Magma Mining Company and then BHP Billiton) in southeastern Pinal County operated between 1955 and 1999 at which time the underground operations were put on "care and maintenance" and the intention to shut down the entire mining operation was announced. By the time the mines, smelter, and other processing facilities were actually shut down and scheduled for removal and reclamation, that mining complex had operated for almost 50 years, employing at peak

[29] ***Arizona Geology,*** State Geologist of Arizona, November 15,2011, http://arizonageology.blogspot.com/2011/11/carlota-copper-mine-to-wind-down.html . Also see KGHM International website which lists the "status" of the mine as "Nearing Closure and in reclamation."

[30] httphttp://www.flambeaumine.com/documents/factsheets/overview.pdf://www.quadrafnx.com/our-operations/open-pit/carlota-mine/default.aspx .

[31] Feasibility Study of the Copperwood Project, Upper Peninsula, Michigan, USA, prepared for Orvana Resources US Corporation by K D Engineering, March 21, 2012.

as many as 5,000 workers and still employing 2,200 at the time BHP Billiton announced the intended shut down in 1999. A new mine being analyzed in the San Manuel area, the Copper Creek Property owned by Redhawk Resources, would employ 100 to 400 workers and operate for 10 to 20 years depending on the price of copper and the cost of operating the potential mine.[32]

Because of the very high capital costs associated with modern metal mines, mining companies are constantly seeking ways to accelerate the extraction of the ore once the construction and equipment costs of the mine have been incurred. That, of course, allows the more rapid recovery of the initial investment. This can lead to an acceleration of ore extraction and the shortening of the life of the mine. This is especially true of mines using block or panel caving techniques such as has been proposed by Resolution Copper that require very substantial upfront investment in developing the mine before mining begins. [33]

Resolution Copper and its investors may wish to operate their proposed mine continuously at its full design level of production for fifty years. However, the actual costs of operating the mine as mining proceeds, the fluctuating market price of copper, and developments in mining technology may lead to a quite different, more irregular and abbreviated, outcome, as they have regularly in the past.

4. The Limited Ability of Rural Areas to Capture the Positive Impacts of Mines

One of the most important reasons that the Pollack Report's estimated jobs, payroll, tax revenues, etc. associated with the proposed mine is misleading when it comes to the area where the mine will be located is that the mine will be located in a relatively isolated area of small towns and rural areas surrounded by public and Tribal lands. Such rural areas have a limited ability to supply the needs of the mine and, even, to supply the workers that the mine will need or the needs of the new workers and their families. Such small towns and rural areas simply do not have the commercial infrastructure necessary to serve the needs of the mine and its workers.

As a result, most of the expenditures associated with the mine will immediately leak out of the small towns and rural areas where the mine is located. That income and wealth will not pass through local hands. For that reason there will be limited stimulation of the existing economy in the vicinity of the mine.

This is especially the case given that Arizona's largest metropolitan area, Phoenix and its sprawling suburbs, is located just an hour away by highway from the Town of Superior and the proposed mine. Much of the support for the mine and its workers would be provided from that metropolitan area of 4.3 million residents, the 14th largest urban area in the nation.

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[32] http://www.redhawkcdn.net/2010-ScopingStudy.pdf p. 67. Also see: http://www.azmining.com/article/san-manuel-area-may-get-new-underground-mine

[33] See "Fast Forward," in ***Mining Magazine,*** page 68, Carly Lovejoy.

The Pollack Report recognized that fact and decided that in order to estimate the full impact of the proposed Resolution Mine, it had to focus on the entire state, not the local area where the mine would be located. As the Pollack Report stated:

> People working at the mine would commute to work from their homes in all parts of the region. Therefore, the economic impact is expressed in this report as a **statewide** benefit. (P. 23, emphasis added)

Thus, the Pollack Report's estimated increase in employment by 3,700 is **not** a projection for the area where the mine is located, i.e. the greater Superior area. Pollack's projected jobs, like the projected payroll and tax revenues, will be distributed throughout Arizona, especially to the Phoenix metropolitan area. The Pollack Report does not always make it clear that it is analyzing statewide impacts, not local impacts. Pollack discusses impacts on "local governments" and "counties." But these are not Superior or Globe but all of Arizona's towns and all of its counties. They are statewide impacts, not local impacts.

5. The Mobility of Miners and Income Leakage out of the Mining Area

Most employees of mines usually do not live adjacent to the mines. This is rational behavior since miners know that mining employment is cyclical and mining creates environmental hazards and tends to scar the landscape in a permanent way. The shutdown of a mine or smelter could put large numbers of people out of work while at the same time depressing local real estate prices. Toxic sites and environmental damage also reduce property values. To protect the investments that the relatively well-paid miners have made in the value of their homes, miners tend to locate those homes at some distance from the immediate impact area of the mine.

As a result, miners tend to commute in to work at the mines and ore processing facilities and then commute back to their homes. The Pollack Report recognizes this likelihood:

> The same [mining employment] opportunities will be offered to the entire region within a reasonable geographic area that would comprise the [Resolution] project's accessible labor base. This includes communities such as Miami, Globe, Kearny, Hayden, Winkelman, and the San Carlos Apache Reservation. It could also reach communities to the southwest such as Florence and Queen Creek. The presence of the mine and supplier industries will drastically improve the health of these local economies by putting current residents back to work and attracting additional residents to the area with new employment prospects. (p. 15)
>
> ……..
>
> People working at the mine would commute to work from their homes in all parts of the region. Therefore, the economic impact is expressed in this report as a statewide benefit. (p. 23)

Note the emphasis on mine employees commuting in from their distant residences and the emphasis on new population moving to the region around the mine to take advantage of the increased employment opportunities. The Pollack Report also argues that over time more and more of the new workers would move to the immediate Superior area to avoid long commutes. This projection is tied to the *assumption* that the mine will operate stably over a fifty-year period. As the Pollack Report put it:

> "The long term potential for the [Resolution Copper Mine] project is crucial in this regard. As opportunities for ***stable*** employment continue for the next several decades, additional opportunities for local employment will increases…For longer term projects, employees become vested in their place of work and also in the local community as do suppliers of business inputs." (p. 15, emphasis added)
>
> "With limited nearby options, the preferences for the employee's household and their threshold of acceptable commute times will factor greatly in the magnitude of new home construction demanded within or near the Town [of Superior]. Superior's remote location encourages local home development. **This is especially true for projects with long-term operational expectations**." (p. 16, emphasis added)

In fact, it does not matter what Resolution's "long-term operational expectations" are. What matters is how the international market for copper actually develops and what the frequency and magnitude of production and employment fluctuations actually turns out to be. The mining company's *hopes* do not control copper market fluctuations. The Pollack Report simply makes the unrealistic assumption that production, employment, and payrolls will be relatively stable over a 50-year period. This simply assumes away a major costs associated with copper mining while allowing Resolution's analysts to engage in developing a fantasy of the Town of Superior being launched on a smooth upward trajectory for a half-century or more. Of course, that is not what Superior has experienced in the past with copper mining and there is no reason to believe that is what it will experience with Resolution's proposal this time either.

Because of the mobility of miners and their avoidance of "mining towns", the impact of a new mine on the local area immediately around the mine will be much smaller than the employment and payroll associated with the mine suggests. That payroll will *not* flow primarily to local residents. Much of it will immediately "leak out" of the local economy to the towns and counties where the many in-commuting mine workers actually live.

Typically, if the mine and mill will employ 1,000 workers, it will be said that 1,000 new jobs will be created *for residents* of the town. But people who live in a town often do not work in that town and those that work in that town often do not live there. In addition, how much of residents' or workers' income actually gets spent in that town is largely determined by whether that town is a regional trade center or largely just a residential location.

When relatively high-paid jobs are created, all residents within commuting distance can be expected to compete for the jobs and the new business is likely to hire the most qualified of those who apply. As a result, the jobs will often go to people who commute in to work there. This means that the economic benefits of the mining and milling become relatively widely dispersed throughout the region and do not primarily flow to local residents. This partially explains why mining towns often are not as prosperous as the high wages and payroll would suggest.

As discussed above, technological change in metal mining, especially metal mines that use contemporary automated block cave mining techniques as Resolution Mine proposes, will have even less of a connection with the local labor force. As one recent analysis of the change in the demand for workers that will accompany automation and use of robotics described it:[34]

> Automation will reduce the number of operational employees required for functions targeted for automation such as drilling, blasting, train driving and truck driving. While new roles will be created in the development, observation, servicing and maintenance of autonomous and remotely controlled equipment, other traditional roles will remain (including roles related to site rehabilitation, road building and other site works.) (p. 16)
>
> New [worker] roles in equipment maintenance, data processing, systems and process analysis, operational control and mine planning are likely to emerge with more operational role being undertaken from consoles in remote operations centers. These new roles are likely to require higher-order skills and different competencies, including mathematics and science and an aptitude for using information technology. Demand for professionals such as technicians, mechatronics and communications engineers is also likely to increase. (p. 17)
>
> Transitioning the existing workforce to these new roles will not be easy. Other industries (such as the car industry) that have endeavored to retrain traditional operators to work in automated environments have experience poor retention, despite significant investments in training and change management. (p. 17)
>
> Automation is likely to drive a change in workforce management from…residential employees to an increase in the number and concentration of employees located in [central] cities. One mining company in Australia has moved to situate a remote operations centre in a regional town, but most centres have been located or planned in [central] cities. (p. 19)

[34] "Exploring the social dimensions of autonomous and remote operation mining," K. McNab et al. Centre for Social Responsibility in Mining, The University of Queensland, Brisbane, Australia. 2013.

This shift of mine employment to urban areas remote from the mine site itself has some distinct advantages in more widely distributing the benefits of mining. That urbanization may improve the range of opportunities for mining employees and their families in terms of employment, education, housing, and transportation. In addition because it reduces the reliance on long-distance commuting, the possibility of shorter work shifts, the less physical nature of mining work and a more professional workplace culture, may help to increase workforce participation of underrepresented groups such as women and older workers.

But it would do this by reducing the employment opportunities for current residents in the vicinity of mining operations including Native Americans who wish to remain living in their communities and traditional blue collar workers who in the past benefited from mining jobs. More of the value or benefits created by the mining would shift to locations remote from the mine while leaving many of the environmental and social problems in the region immediately around the mine. This may raise questions of environmental justice.

6. The Economic Implications of Environmental Degradation

Finally, the quality of the local natural and social environments are crucial to supporting several important sources of local economic vitality: Holding and attracting new residents and businesses, attracting the foot-loose income associated with retirees and investors, attracting business activity linked to professional and technical services, high tech manufacturing, and information workers, and encouraging a diversified visitor economy. Mineral extraction tends to be land-intensive, imposing a disruptive footprint on the natural landscape and contributing to significant environmental degradation. This makes mining-dependent areas less attractive places to live, work, and do business, depressing economic diversification and development.

Put somewhat differently, all economic activities are not necessarily compatible with all other economic activities. That is why all economic activities do not take place in the same location. Certain economic activities, because of their characteristics, can and do displace other types of economic activities. The environmental degradation associated with mining will tend to displace those economic activities that thrive on attractive natural and social environments. Obviously tourism and recreation, and the rest of the visitor economy, which rely on attractive natural landscapes, will be displaced by industrial activities that degrade those landscapes. This is not only a concern about impacts on “tourism.” Natural and social amenities can also attract new permanent residents, entrepreneurs, new businesses, as well as retirees. “Amenity supported” economic development can also be short-circuited by industrial activities that damage attractive local characteristics. Mining, because it is landscape intensive in its operations and brings instability to communities dependent upon it, can do exactly that.

In arid regions like Arizona, the limited supply of water also means that a new water intensive industry necessarily displaces other existing water intensive industries. The Resolution Mine will impact water availability is several ways. First, because of the deep location of the ore deposit and the even deeper location below the ore deposit where

the block-cave mining will take place, massive amounts of ground water will have to be continuously pumped out of the mine, potentially causing the water table in the surrounding area to decline. Second, Resolution Copper will need much more water than this ground water pumping will provide. Given the fact that Arizona's water supply is likely to be completely committed to other uses in the 2020s when the mine is scheduled to begin producing, the mine's use of water will displace other existing uses of Arizona's limited water. Finally, the mining and processing of sulfide copper ores runs the risk of triggering acid mine drainage that can produce a toxic water pollution problem that can require perpetual treatment. That is, the mine has the potential to permanently damage part of the existing water supply in the area of the mine.[35] These impacts on a scarce but crucial resource in Arizona, water, are additional costs associated with the proposed mine.

7. The Economic Impacts of Uncertain Employment and Payroll

The well-known economic instability of mining-dependent economies leads businesses and households to be very cautious about the investments they make in areas dependent on mining. Since workers, residents, businesses, and local governments do not know how long the mining employment and payrolls will last, they reduce their risk by avoiding fixed investments that may be lost if the mineral industry enters a period of decline. As a result, mineral workers commute long distances to jobs, maintaining residences at some distance from the mineral development. Businesses are hesitant to develop local commercial infrastructure and local governments are hesitant to finance public infrastructure with debt. Entrepreneurial talent also tends to avoid or leave "company" towns because the mine tends to dominate the town economically and politically creating a culture of dependence rather than one of innovation. The result is a less fully developed local economy and more income leakage out of the local economy. In short, excess dependence on mining tends to constrain local economic development, leading to the depressed economic conditions that have come to characterize many mining-dependent areas.

The policy implications of this description of the problem are straightforward:

a. A commitment to mining is probably not a good economic development strategy because of the instability it can bring to the local economy.

b. In addition, avoiding more environmental damage associated with new mining and repairing the damage associated with past mining is important in making the community an attractive place for current and new residents and businesses that promotes long-term economic development.

c. Projecting that a mine will operate continuously for an indefinite period with more or less constant employment and payroll is unrealistic because it ignores the market cycles in metal prices and production and the ongoing deployment of

[35] L. Everett & Associates report to San Carlos Apache Tribe, March 18, 2013.

labor-saving technology. For more than a century, metal production and employment have fluctuated widely disrupting communities that depend on mining. There are no 50-year periods when major expansions and then contractions did not take place. Recall Figures C, E, and F above.

d. Assuming that all of the jobs associated with a mining project will be filled by local residents who will then continue to live in the area immediately around the mine and, therefore, that the mine payroll will primarily circulate within that local economy is unrealistic. Many of the jobs will go to in-commuting and in-migrating workers from a broad geographic area. As automation and robotic technologies are applied in the new mine, more of the workers are likely to live and work remotely at some distance from the mine. As a result, that payroll and its impact on the economy will quickly leak out of the local area and be diffused across a broader geographic area.

VI. The Limits of Economic Impact Analysis

The Pollack Report is built around a particular approach to analyzing a regional economy and local economic wellbeing. It is typically labeled *economic impact analysis*. That set of tools allowed the Pollack Report to estimate spectacular "benefits" associated with the proposed Resolution Mine. Those "benefits" included:[36]

- $61.4 billion in total economic impact on the State of Arizona
- 3,700 new jobs with total annual payroll of $220.5 million per year.
- $19.9 billion in new tax payments to governments.

It is important to understand the tools used by the Pollack Report to project these enormous "benefits" and the limitations of those tools.

The Pollack Report explicitly lays out the limited character of its economic impact analysis. Those "limiting conditions" include:

- Costs associated with environmental and engineering issues and the cost of their correction were not included in the study.

- The study did not consider the potential reduction of sales at other establishments in the trade area that may occur as a result of the proposed Resolution mining project.

- The study did not consider the costs to any government associated with providing services to the mine or other operations.

[36] Tables A and B, pp. ii and iii.

These are not minor limitations on the Pollack Report's approach to analyzing the *impacts* that the Resolution Mine would have on the region. We interpret these "limitations" on the Pollack Report to mean the following:

- Environmental costs associated with the building and operation of the mine will be ignored. The environmental cost will be assumed to be zero.

- Any conflict between the mining activity and its environmental impacts on other economic activities in the region of the mine will be ignored. The study will assume that the new mine and its operation and production will be entirely compatible with all existing and potential future economic activities in the region.

- Governments will not have to extend services to the mine or its employees or the towns and neighborhood in which they reside. That is, despite hiring 3,700 new workers, they and their families will need no services such as schools, police and fire protection, expanded roads and upkeep of roads, social services, etc. As a result, taxes paid as a result of the operation of the mine will be "free money" unencumbered by the need to pay for expanding services.

These "limitations" largely transform a study that sounds like it will study all of the impacts associated with the proposed mine into a study that will only look at benefits associated with the mine. That is, even though this is labeled an "economic" study and in theory all "impacts," both positive and negative, will be considered, the study begins by declaring that it will only study benefits and will ignore costs. Since economic analysis focuses on choices and tradeoffs in situations where we face costs as well as benefits, Pollack's proposed "pure benefits" approach is difficult to label an economic analysis. Economists are fond of warning people that "there is no such thing as a free lunch," meaning that there are almost always costs that have to be taken into account in any real economic choice. The Pollack Report begins with the declaration that it will only analyze benefits, i.e. it will engage in "free lunch economics." That is worrisome given the important public policy decisions that have to be made before the mine can ultimately be permitted.

Mining is landscape and environmentally intensive. That is why metal mines are often controversial. They typically permanently degrade the natural landscape and can trigger serious pollution of ground and surface waters, sometimes in ways that require perpetual treatment. Mining can industrialize rural landscapes, lead to air pollution, light pollution at night, disrupt wildlife habitat and travel routes, and make large demands on local water sources. In addition, mining production can fluctuate significantly with international market conditions, causing employment, payrolls, purchases from suppliers, and tax payments to governments to fluctuate or "flicker" too. That can seriously disrupt local communities.

The <u>design</u> of the Pollack Report is non-economic, even anti-economic, in the sense that it takes a major industrial operation that has considerable costs associated with it

and turns it into an “angelic” activity with no costs. By design the Pollack Report conveniently dodges almost all of the important policy implications associated with permitting the proposed mine.

This is not how economic impact analysis should be carried out. “Economic impact” is a sweeping term referring to all of the impacts likely to be felt by a community as a result of a significant change in economic activity. Typically that involves both positive and negative impacts. The same can be said about studying the impacts on government budgets. Such fiscal analysis would look at both the impact of a new set of economic activities on the demand for government services or the quality of existing government services and the flow of revenues available to fund those services. Unless both are analyzed, one does not know what the impact is likely to be on the ability of governments to maintain an adequate standard of service and balance its budget without raising taxes.

The type of “pure benefit” economic impact analysis provided by the Pollack Report is more a public relations document to promote the proposed Resolution Mine project than it is an economic study. It conveniently assumes that the proposed mining project has no costs associated with it, and only considers benefits.

VII. The Distribution of the Impacts of the Resolution Mine

1. The Uneven Distribution of the Impacts of the Resolution Mine across Geography and Individuals

The distribution of the impacts of the proposed Resolution Mine among various communities and individuals is important because it determines who bears the costs and enjoys the benefits associated with the mine. It also can change the relative importance of the impacts on the people who experience them. For example, 1,500 jobs would represent a major change in a local area with a current workforce of only 11,000. But for the state of Arizona with 3.2 million jobs in 2011 and which created 63,000 jobs **per year** over the last two decades, 1,500 jobs would be almost imperceptible, a change of five-hundredths of one percent. Within the national economy where over 144 million people are working, 1,500 jobs would vanish in the statistical noise of the data. The same can be said about tax revenues. Additional tax revenues of $270 million a year would be significant within the context of the Arizona state government budget of over $8 billion, a 3 percent contribution. But within the U.S. federal government budget of $2.6 *trillion,* that $270 million would be relatively minor, one-hundredth of one percent.

Typically in economic impact analysis as one moves from a small local economy to a larger economy, the economic impacts increase in size because the larger economy is more capable of supporting the additional economic activity and, in the process,

capturing and recirculating the expenditures. At the same time, as the size of the geographic area being considered increases, the *relative* importance of the impact shrinks in size because the total size of the economy expands much faster than the additional impacts being captured.

That is why it is important to put stated economic impacts in the context of the size of the overall economy. In some settings 1,000 jobs is an enormous change. In other settings, it is likely to pass unnoticed.

The distribution of the economic value created among different groups of individuals is also likely to be important. Typically economic impact analysis emphasizes the wages, salaries, and benefits paid by the new jobs to workers. It also emphasizes tax payments to local governments. It does so because such studies typically are public relations exercises by the mine proponents and they are eager to emphasize the benefits of the mine to the local population and local governments. Assumedly that is because it is also the local population and governments that will have to cope with whatever environmental and social costs are associated with the construction and operation of the mine. The mine proponents want to assure local communities that they will receive benefits that more than compensate for those costs.

Modern metal mines tend to be very capital intensive, investing, as they do, enormous amounts of money exploring, planning, developing, constructing, outfitting the mine with equipment, and operating the mine. As a result, much of the revenue generated by the mine flows not to workers but to those who own the land and mineral rights, those who invest money in the operation, and the entrepreneurs who develop the mine's mineral potential. While a significant part of the wages and salaries paid may circulate within the local economy, the return to investors and owners does not. It flows out of both the local and state economy to investors across the nation and around the world. It is important to understand the distribution of the revenues associated with the mine among the different participants in the construction and operation of the mine.

2. Modeling the ***Local*** Economic Impacts of the Resolution Mine

One of the most important reasons that the Pollack Report's estimated jobs, payroll, tax revenues, etc. associated with the proposed mine is misleading when it comes to the area where the mine will be located is that the mine will be located in a relatively isolated area of small towns and rural areas surrounded by public and Tribal lands. Such rural areas have a limited ability to supply the needs of the mine and, even, to supply the workers that the mine will need or the needs of the new workers and their families. Such small towns and rural areas simply do not have the commercial infrastructure necessary to serve the needs of the mine and its workers.

As a result, most of the expenditures associated with the mine will immediately leak out of the small towns and rural areas where the mine is located. That income and wealth will not pass through local hands. The end result is that there will be limited stimulation of the existing economy in the vicinity of the mine.

This is especially the case given that Arizona's largest metropolitan area, Phoenix and its sprawling suburbs, is located just an hour away by highway from the Town of Superior and the mine. In fact, the Phoenix Metropolitan Area includes Pinal County where the Town of Superior and the proposed Resolution Mine are located. Much of the economic support for the mine and its workers will be provided from that metropolitan area of 4.3 million residents, the 14th largest urban area in the nation.

The Pollack Report recognized that fact and decided that in order to estimate the full impact of the proposed Resolution Mine, it had to focus on the entire state, not the local area where the mine would be located. As the Pollack Report stated:

> People working at the mine would commute to work from their homes in all parts of the region. Therefore, the economic impact is expressed in this report as a **statewide** benefit. (P. 23, emphasis added)

Thus, the Pollack Report's estimated increase in employment by 3,700 is **not** a projection for the area where the mine is located, i.e. the greater Superior area. Pollack's projected jobs, like the projected payroll and tax revenues, will be distributed throughout Arizona, especially to the Phoenix metropolitan area.

In order to analyze the capacity of the area around the mine to capture and circulate the money generated by the operation of the mine and realize economic benefits locally, this study applied the same IMPLAN economic impact model that the Pollack Report used. However, this study applied that model to a smaller sub-state region around the mine's location in both Pinal and Gila Counties. This study used the nine contiguous zip code areas that stretch from the Superior area east to San Carlos, including Miami and Globe, and south to Hayden and Winkelman.[37] These contiguous zip codes had about 33,000 residents in 2010. Figure K below shows a map of the region, the population densities around the proposed mine, and the approximate local study area within that region of central Arizona.[38]

[37] The Pollack Report identified a similar "local" area but did not use it for its estimates of the Resolution mine's impact since the Pollack chose to do its analysis on a statewide basis. In Table 4 of the Pollack Report, "Superior and Surrounding Area" was defined as we have except that we did not include the Mammoth area. On page 15, the Resolution project's "accessible labor base" from which it could draw its workers included the same communities we have used except that we included the contiguous zip code areas rather than just the towns themselves. The incorporated towns had populations of about 19,000 while the contiguous zip code area had a population of about 33,000. The Pollack Report also included the Florence and Queen Creek areas to the west of Superior. We did not include them because they are part of the sprawling suburbs of the greater Phoenix area and we wanted to study the proposed mine's impacts in the rural area around the mine.

[38] The zip-codes are 85135 (Hayden), 85137 (Kearney), 85173 and 85273 (Superior), 85192 (Winkelman and Dudleyville), 85501 and 85502 (Globe), 85539 (Miami), and 85550 (San Carlos).

Figure K.
Map of Nine-Zip-Code Study Area

Our local study area is dramatically smaller, obviously, than the state of Arizona, which had about 6.4 million residents and 3.2 million total jobs compared to the 33,000 residents and 11,400 jobs in our local study area. Our local study area is also much smaller than Pinal County but has the equivalent of 61 percent of Gila County's population and 56 percent of its jobs. See Table D below.

Table D.

Population and Employment in Alternative Study Areas		
Geographic Area	Population	Employment
	2010	2013
Nine Contiguous Zip Codes	32,539	11,370
Pinal County	375,770	128,442
Gila County	53,597	20,414
Arizona	6,392,017	2,779,182
Source: AZ Unemployment Statistics Program; U.S. Census Bureau		

AZ zip code_county_state population totals.xls, Sheet 1, E29

Power Consulting's IMPLAN modeling for this local area began with the same defining characteristics of the proposed Resolution Mine that the Pollack Report used, which is the information provided by Resolution Copper as to the projected annual production, employment, payroll, taxes, and supply purchases associated with the mine. However this study focused on a much smaller geographic area immediately around the mine rather than on the state as a whole. The direct impact of the mine remains the same given that information is reported on the basis of what is happening at the mine site such as how many people are employed, what is the payroll, and what is the value of

the output. These direct impacts do not tell us anything about *where* the workers live or *where* the purchases are made.

IMPLAN estimates what part of the supplies needed by the mine can be purchased locally given the mix of businesses located within the local study area (*indirect impacts)*. It also estimates how much the workers at the mine and the workers associated with mine suppliers are likely to spend in the local area (*induced impacts)* and how much of those worker expenditures are likely to leak out of the local study area because of the limited set of businesses located there. It is those indirect and induced impacts that will be smaller for our local study area than those estimated in the Pollack Report for the entire state. See Table E below.

Of note is 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. This is not surprising given the small town and rural area surrounding the mine. That area cannot supply the mine and its workers the way the Phoenix and Tucson metro areas can.

Table E.

Local Study Area and State-Wide Impacts of the Resolution Mine				
Type of Impact	Employment		Labor Income	
	Statewide	Local Area	Statewide	Local Area
	Pollack	Power	Pollack	Power
Indirect Effects	934	221	$57,260,717	$17,179,349
Induced Effects	1,356	329	$56,001,372	$11,535,315
Source: Pollack Table A; Power Consulting IMPLAN Modeling.				

Power Consulting_Table 9 recreation_7_17_2013_DSP, Power table 9 re-creation, B66

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3. The Distribution of Employment and Payroll Impacts

The total employment and payroll impacts that IMPLAN projects for our local study area are only about a quarter of the statewide impacts the Pollack Report projects. That is, most of the impacts of the proposed Resolution Mine will “leak out” of the local area because the small towns and rural areas cannot provide workforce, goods, or services needed to supply the mine and the needs of the worker’s that fill the “multiplier” or “ripple” effect jobs associated with the proposed mine. See Table F below.

Table F.

Comparison of Economic Impacts: Statewide v. Local Zip Codes				
Type of Impact	Employment Impacts		Payroll Impacts ($millions)	
	Pollack Statewide	Power Local Zip Codes	Pollack Statewide	Power Local Zip Codes
Direct	1,429	342	$108.6	$27.5
Indirect	934	221	$57.3	$17.2
Induced	1,356	329	$56.0	$11.5
Total	3,719	893	$221.9	$56.2

Source: IMPLAN modeling by the author; Pollack report, Tab. 16.

Power Consulting_Table 9 Recreation_7_16_2013_DSP.xlsx, F47, Power Table 9 Recreation

See the Appendix for a more detailed discussion of our local study area IMPLAN modeling.

Our smaller estimated *local* impacts are not surprising given the rural and small town character of the mine site. These *local* impacts, while much smaller, are still significant. For instance, new or existing residents would fill 342 of the mining jobs, 224 of the jobs associated with supplying the mine, and 329 of the jobs associated with workers spending their paychecks. Total new jobs going to residents of the local area around the mine site would be just under 900. The additional payroll receive by residents of the local area would total $56 million per year.[39]

To put this in context, in 2013 there were between 12,000 and 13,000 jobs in our nine zip code local study area[40]. Our projected local job impact would represent a 7 to 8 percent increase in employment opportunities.

These increased employment opportunities in the local area might be assumed to lower the relatively high unemployment level in the area to relatively low levels, which is what the Pollack Report projects:

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[39] While the indirect and induced jobs are those estimated by the IMPLAN model as a result of the operation of the proposed Resolution Mine, the direct employment at the mine of residents of the local area is not something IMPLAN estimates. IMPLAN counts employment by *place of work*, not by *place of residence*. We assumed that the ratio of the local zip code study area impacts (Power Consulting) and the statewide impacts (Pollack Report) provided an indication not only of jobs and payroll created in the local area but also the percentage of the jobs that would be filled by new or existing residents. This may overstate the indirect and direct jobs filled by local residents if there is considerable in-commuting of workers to fill those jobs. On the other hand, if more mine workers actually move to the local area to live, we could be underestimating the number of jobs filled by residents.

[40] Arizona Unemployment Statistics Program, Special Unemployment Report, workforce, employment, and unemployment by county and urban area, 2013. http://www.workforce.az.gov/local-area-unemployment-statistics.aspx . This data series mixes incorporated towns and cities and Census Designated Places. In that sense it does not appear to be geographically inclusive and may not include all of the workforce and jobs in our contiguous zip code local study area. We also used Pinal County population and employment data to indicate the general relationship between employment and population (U.S. Bureau of Economic Analysis, Regional Economic Information System).

> Of those unemployed in the Town of Superior, depending on the compatibility of skill sets of those seeking work, a few hundred job openings could quickly reduce unemployment to negligible levels.
>
> ……
>
> The presence of the mine and supplier industries will drastically improve the health of these local economies by putting current residents back to work and attracting additional residents to the area with new employment prospects. (p. 15)

Although the creation of a large number of additional jobs might appear to automatically reduce the number of local unemployed workers, that is not what has happened in the Superior area, as Resolution hired hundreds of contract workers to work on widening the shafts and the continued exploration of the mineral deposit over recent years.

Between 2000 and 2010 total employment in the Town of Superior rose by 731 workers. That was a spectacular increase of 67 percent in total employment. During the same period, however, unemployment rose by 428 workers, almost a five-fold increase from the level of 120 in 2000. Many of the new workers were associated with exploration and development of the proposed Resolution Mine. Resolution had about 530 workers on site in 2012. How could employment rise dramatically and unemployment rise even more dramatically? There is only one explanation, the total number of residents seeking work increased dramatically too, but they did not find work. In fact the total labor force seeking jobs in Superior rose by almost 1,200, far outstripping the 731 new jobs that were created. See Figure L below.

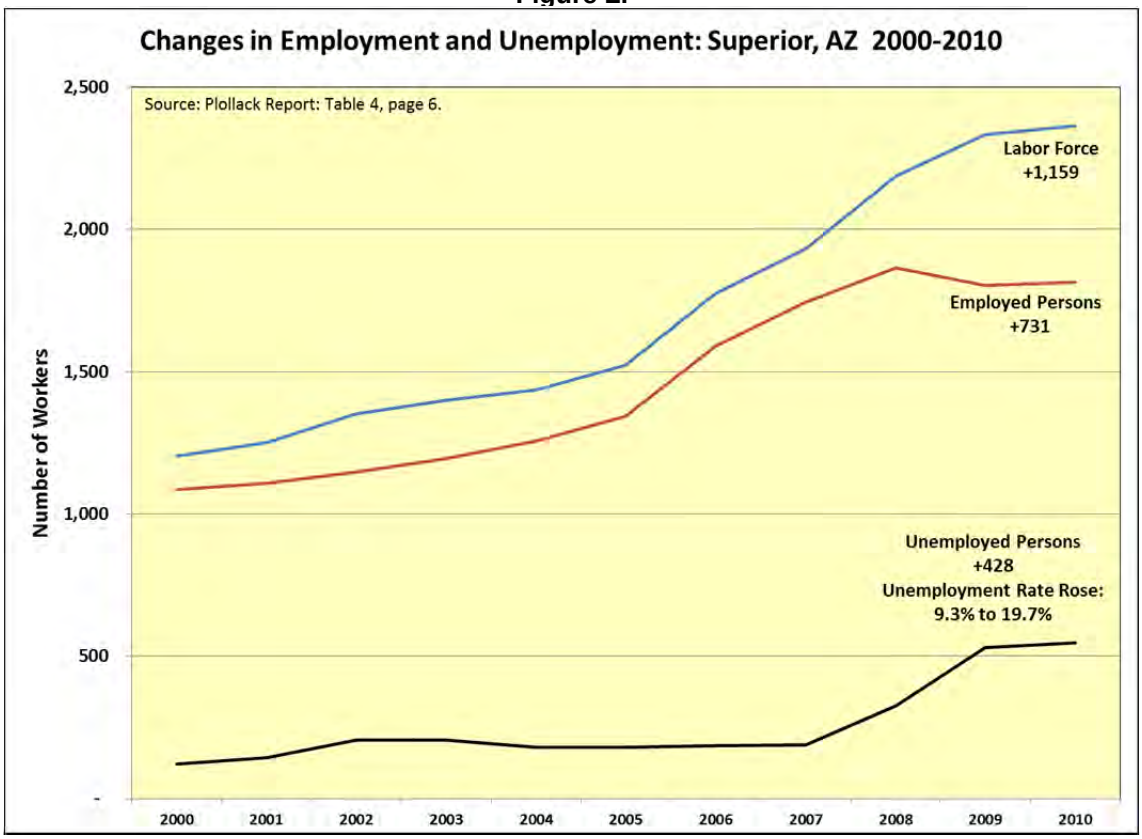
This is not unusual. When new relatively well-paid jobs are being created, large numbers of people are likely to come to the area in hopes of getting one of those jobs, especially if the expectation is that ongoing hiring is likely to take place. Also, when workers in relatively high paid jobs are laid off, they often stay in the area even though they are unemployed rather than move to another area and take a deep pay cut. That is one of the reasons that unemployment rates are so high in mining towns. Workers hang on unemployed waiting for one of those well-paid jobs to open up.

Clearly the Pollack Report was incorrect in suggesting that “a few hundred job openings [from Resolution Mine] could quickly reduce unemployment to negligible levels” in Superior or the region around the mine. Resolution did exactly that recently and unemployment rates shot up. The unemployment rate did **not** decline to negligible levels.

In late 2012 Resolution Copper Company announced that by early 2013 it would be laying off approximately 400 workers, about 75 percent of its overall workforce in the Superior area.[41]

[41] Resolution Copper Mining news Release, November 30, 2012, Bruce Richardson.

Figure L.



4. The Distribution of Tax Revenues Associated with the Resolution Mine

A. The Pollack Report's Conclusions

The Pollack Report spends about half of its pages analyzing what it calls the "fiscal" impacts of the proposed Resolution Mine on various levels of government such as local municipalities, counties, Arizona state government, and the federal government.[42] The Pollack Report concludes that the proposed mine would "generate total federal, state, county and local tax revenue of nearly $20 billion" from corporate income taxes, property taxes, severance taxes, sales taxes in addition to a broad range of other taxes.[43] However, about 70 percent of these "tax benefits" would flow to the federal government while Arizona counties would receive $2.6 billion dollars in "fiscal benefits" and municipalities would receive $819 million in benefits. The Arizona state government would receive $2.6 billion in "fiscal benefits."[44] Even if one focuses only on Pollack's state and local government "fiscal benefits," they are huge, totaling $5.8 billion dollars. If

[42] Pages 8-14, 16-17, and 23-26.
[43] Page ii.
[44] Page iii.

these are accurate estimates of the impact of the proposed Resolution Mine on local government finance in a time of increasingly strained government budgets, this is likely to be seen as a very positive economic aspect of the mine. Unfortunately these estimates are not accurate.

B. Errors and Exaggerations in the Pollack Estimates of "Tax Benefits"

The "fiscal impact" estimates contained in the Pollack Report represent gross exaggerations of the net impacts of the proposed Resolution Mine on local government fiscal balance. The "fiscal impacts" are exaggerated by the Pollack Report in several ways.

i. Consistent with the "economic free lunch" approach of economic *impact* analysis, Pollack only looks at increased revenues flowing to governments while ignoring the cost of meeting the increased demand for government services associated with the mine. Taxes are the way we pay the cost of government services associated with residential settlement and economic activity. Taxes are not "pure benefits" to anyone involved, neither the taxpayer nor the governments. Pollack does not estimate the net impact of the proposed mine on the *fiscal balance* faced by governments.

ii. Pollack presents the sum of the projected tax payments directly or indirectly associated with the proposed mine over a *64-year period.* This grossly exaggerates the benefits to local governments as they *annually* seek to balance their budgets. This is grossly misleading. It is the equivalent of saying that the pay associated with the mining jobs will be about $4 million per job instead of saying that the pay will be $75,000 per year. No one, certainly no economic analyst, would state the pay associated with a job in terms of the cumulative pay over 50 or 64 years. That would suggest that the workers lucky enough to obtain one of these jobs will become instant multi-millionaires. That obviously is a serious misstatement, grossly exaggerating an already attractive $75,000 a year salary. Alternatively, it would be similarly misleading to state the total employment associated with the mine not as 3,700 jobs but as 238,000 jobs by adding each year's employment up over the projected life of the mining operations.[45] Stating tax revenues in this sort of cumulative manner over a sixty-four year period is equally a gross error intended to exaggerate the impacts that will actually be experienced.

iii. The Pollack Report focuses on the statewide and nationwide impacts, providing almost no analysis of the likely impacts in the greater Superior area where the mine will be located. This is not always clear in Pollack's

[45] The Pollack Report does sum jobs up over the 64-year projected life of the mine, but correctly labels it "person years of employment," not "jobs" and primarily emphasizes the annual employment level. Table 6, page 8.

presentation of the additional tax receipts received by “counties” and “local governments.” The “counties” on which Pollack is reporting are not Pinal County where the mine is located or adjacent Gila County. Rather, it is all of Arizona’s 15 counties taken together. Similarly, the “local governments” that received tax revenues due to the proposed mine are not Superior or the mining towns in the “copper triangle” including Globe and Miami. Instead it is all 91 incorporated towns and cities in Arizona taken together. Focusing on the nation and entire state of Arizona allows the estimation of the largest tax flows possible but provides almost no indication of what the impacts will be in the area were the proposed mine will be located.

iv. The Pollack Report assumes a relatively steady copper production, employment, payroll, and tax payments across the fifty-year period of projected operation of the Resolution Mine. As discussed earlier, that is not the manner in which copper mines have operated in the past or present and an unlikely pattern of production to expect in the future. Copper production and employment, along with the tax revenues they generate fluctuate significantly or “flicker” over time, leading to layoffs and reductions in tax payments. The Pollack Report ignores these many years of reduced tax payments in its calculations.

v. Without saying so, the Pollack Report implicitly assumes that all of the jobs associated with the proposed mine, both directly and indirectly, will be filled by in-migrants to Arizona and the greater Superior area. Although that assumption is at odds with Pollack’s assertion that many of these jobs will be filled by the unemployed in the Superior area, making this assumption allows Pollack to estimate a larger positive impact on tax payments. The Pollack Report assumes that each new job created is filled by someone who is currently not paying sales, income, property, or other state and local taxes. That can be true only if the people taking the jobs come from outside of the Superior area and Arizona itself.[46] This has important implications for how the benefits of the proposed mine are distributed. Many, if not most, of the benefits will flow to people who currently are not residents of Arizona. In addition, population will increase in order to fill the new jobs. The added population and accompanying economic activity will increase the demand for and cost of public services.

Below we will discuss each of these misstatements about the “fiscal benefits” associated with the proposed Resolution Mine.

[46] IMPLAN does not model *from where* workers filling new jobs come. There is no population estimate associated with IMPLAN modeling results. Jobs could be filled by currently unemployed residents or residents who previously had not been in the labor force. They could be in-migrants or in-commuting workers. The tax revenue implications would be different depending on exactly how these jobs are filled. The model, however, does not attempt to project that.

C. Estimating Fiscal Benefits While Ignoring Fiscal Costs

The Pollack Report defines *fiscal impact analysis* in the following way: "Fiscal impact analysis studies the public revenues associated with a particular economic activity." [47] Although that is how Pollack carried out its "fiscal analysis," that is not what fiscal analysis seeks to do. Fiscal analysis seeks to determine the net impact of a change in economic activity on the fiscal balance faced by particular government units. The word "fiscal" refers to government taxation, spending, and debt management. Simply studying the revenue side does not necessarily tell us anything about the fiscal health or balance faced by a governmental unit. In general, taxes are levied to pay for the public services provided by government. Economic activity, of course, can impact *both* tax revenues and the demand for public services and the level of governmental spending. *Fiscal analysis* seeks to determine what the net impact of additional economic activity on both the increase in government revenues from additional tax payments and the additional cost of the expanded public services that government will have to provide and/or the decline in the quality of government services currently being provided due to the increased use of services that are not expanded.

The Pollack Report projects a "massive influx of employees" into the Superior area beginning in the pre-feasibility, construction, and ramp-up to full production periods. Pollack also projects an influx of new families to the Superior area as workers choose to locate close to the mining jobs and avoid a long commute. As a result Pollack also projects ongoing construction of new homes for workers' families. This in-migration of new residents as well as "massive" in-commuting to jobs in the area will obviously require expanded public services including schooling for children, road building and maintenance, police and fire protection, and the other costs of providing public services to a growing population and economy. Rapidly growing communities do not always or, even, usually, have an easier time balancing their local government budgets. As population and economic activity expand, so do the demands on government budgets. Fiscal analysis looks at the projected **net** impact on government fiscal balance, not just at the tax revenue side of the equation. There are both benefits and costs associated with growing communities. A "pure benefits" analysis, like all imaginary "free-lunch" economic analyses, is incomplete and misleading.

D. Summing Projected Tax Revenues over Sixty-Four Years

The Pollack Report obtains its huge "fiscal benefits" by summing the estimated annual tax payments associated directly or indirectly with the proposed Resolution Mine over the planning, construction, operations, and reclamation periods, 64 years in all. This strange arithmetic exercise has a dramatic impact. Instead of saying, for instance, that the mine directly and indirectly will contribute, on average, $12.8 million dollars each year to the governments of Arizona's incorporated towns and cities, the Pollack Report states that the mine will contribute $819 million dollars. If this were a hospital or other basic economic infrastructure that was expected to operate indefinitely into the future,

[47] Pp. ii and 23.

under Pollack's approach, the tax revenues would be *infinite* since they would go on forever. One could conclude the same thing about employment, labor income, and value of production. They all would be infinite. This type of calculation obviously contains almost no useful economic information. It is pure exaggeration undertaken for public relations purposes.

Government entities budget on an annual basis. They have to balance their budgets on an annual basis. Telling them what the tax flows might be over a 50 or 75 or 100-year basis without any reference at all to what the cost will be of the public services they will have to provide is a useless number that cannot help inform any fiscal decision governments have to make.

E. Ignoring the Governments Most Impacted by the Proposed Mine

The Pollack Report studies the tax impacts associated with the proposed Resolution Mine almost exclusively from a statewide perspective. Although the discussion often mentions the taxes flowing to "counties" or "incorporated cities and towns," the impacts that are reported are not for Pinal and Gila Counties or the towns of Superior, Globe, Miami, San Carlos, Kearney, etc. Instead, the estimated tax impacts are for the all 15 of Arizona's counties and all 92 of Arizona's incorporated towns and cities. Pollack's projections are all statewide impacts, not local impacts.

i. Sharing Copper Severance and Corporate Profit Taxes

Consider the taxes projected to be paid directly by Resolution Copper in the form of severance and corporate income taxes. Arizona tax law distributes parts of those particular taxes to incorporated towns and cities to help those urban areas provide public services. The Pollack Report estimates that $155 million in severance taxes and $252 million in corporate income taxes paid by Resolution Copper would flow to cities and towns. That total flow of $407 million to city and town governments sounds quite beneficial.

As discussed above, however, first we have to divide the projected $407 million tax revenues by 64 since this is a sum of taxes paid over 64 years. That would turn this tax "benefit" into $6.4 million per year, obviously a much more modest number. The distributions of severance and corporate income taxes go to all 92 of Arizona's incorporated towns and cities on the basis of population. That means, of course, that most of these "local government benefits" from the taxes paid by Resolution Copper would flow to the Phoenix and Tucson areas where 85 percent of Arizona's population is found.[48] Because of the very small population of Superior, 2,800 in 2010, very little of the $6.4 million would be received in the city where the mine is actually located, only 0.06 percent or about $3,600 per year. That is, while $412 million in tax benefits are

[48] The incorporated towns and cities in Maricopa and Pinal Counties make up 85 percent of the total population of all of Arizona's incorporated urban areas in 2010.

estimated by the Pollack Report to go to “local economies,” the actual flow of these projected dollars to the local economy being impacted, namely Superior, is about $3,600 per year. Although readers of Pollack’s numbers are bound to be impressed by the $412 million figure, they are likely to be totally unimpressed by $3,600 per year. That is the reason the Pollack Report phrased the “local” economic impacts the way it did, as the sum of Resolution Copper Mine severance taxes received by all 92 incorporated cities in Arizona summed over 64 years.

If we expand the “local” area impacted by the proposed Resolution Copper mine to include the other towns in the area besides Superior, the part of this $412 million in tax revenues flowing to “local towns” does not get much bigger. All six towns, including Globe, Kearney, Miami, Hayden, and Winkelman in addition to Superior have only 0.3 percent of the incorporated city population of Arizona.[49] So those six local towns would together receive about $20,000 per year of the severance and corporate income taxes that Pollack projects will be paid by the Resolution Copper mine.

The same is true of projections of the flow of severance taxes from the proposed mine to *county* governments. The Pollack Report estimates that $252 million of the severance tax would be transferred to the counties. The average annual revenue would only be one-sixty-fourth of this or $3.9 million. This distribution of severance tax revenues to the counties is based on the formula by which the state distributes some of the sales tax revenues. Based on the 2011-2012 distribution of these shared tax revenues, Pinal and Gila Counties would receive 4.9 percent of this distribution of part of the severance tax. That would be about $193,000 per year. The population in our nine zip code study area would have contributed about one-half of one percentage point of the 4.9 percent Pinal and Gila County share or about $966. See Table G below.

Note the dramatic drop in the estimated tax revenue “benefits” when we focus on the actual local area surrounding the proposed mine rather than the entire state or nation: from hundreds of millions of dollars to hundreds or thousands of dollars. Clearly the hundreds of millions of dollars in mine impacts on tax revenues are grossly misleading.

Table G.

Annual Distribution of Mine Severance and Corporate Profit Taxes to "Local" Government Units							
Pollack Report (Table 9)				Power Consulting			
Local Government Unit	Severance Tax Distribution	Corporate Income Tax Distribution	Sum of These Two Taxes	Local Government Unit	Severance Tax Distribution	Corporate Income Tax Distribution	Sum of These Two Taxes
All County Governments in Arizona	$3,934,375	$0	$3,934,375	Pinal and Gila Counties	$ 264,282	$ -	$ 264,282
All Incorporated City Governments in Arizona	$2,428,125	$4,020,313	$6,448,438	Six Incorporated Towns in Nine Zip Code Area	$ 7,334	$ 12,143	$ 19,477
Total	$6,362,500	$4,020,313	$10,382,813	Total	$ 271,616	$ 12,143	$ 283,759

Sources: See Tax Revenue Appendix
Pollack Tax Impacts.xls, Summary, A31

[49] San Carlos on the San Carlos Apache Reservation is one of the larger towns but is not an Arizona incorporate town. In 2010, the San Carlos Census Designated Place had over 4,000 residents.

ii. The Limited Impacts of Mine-Related Taxes on Local Areas

In estimating the tax revenues that would be generated directly and indirectly by the proposed Resolution Copper Mine, the Pollack Report did not focus on the local area where the mine would actually be located, the greater Superior area, because Pollack recognized that most of the tax impacts would take place outside of that area. As pointed out above, Pollack estimates 71 percent of the tax revenues from the proposed mine would flow to the federal government and 13 percent would flow to the state government. That is, 84 percent of the tax revenues flow to government units representing much larger geographic areas significantly removed from the area where the proposed mine would be located.

That is exactly what one would expect in regional economic analysis. The larger the geographic area, the more likely it is that the economic impacts, including the tax revenues, will be captured within that regional economy. Put the other way around, the smaller the geographic area and the more rural it is, the smaller the economic impact, including tax revenues that are likely to be captured within the local economy.

Our nine zip code study area east and south of Superior, including seven towns, had a total population of about 33,000 in 2010. Pinal County, in which Superior, Kearny, Hayden, and Winkelman are located, had a population of 376,000. Gila County were Globe, Miami, and San Carlos are located had a population of 54,000. Thus our study area had only 8 percent of the two-county population and only one-half of one percent of Arizona's total population. Clearly the local area in which the Resolution Copper Mine would actually be located is an area of small towns and rural areas without the commercial economic infrastructure to capture most of the economic impacts associated with the proposed mine.

It was this basic economic characteristic of the area in which the proposed mine would be located that led the Pollack Report to conclude that in order to describe the *total* impact of the mine on the generation of tax revenues, the tax analysis had to focus on the entire state economy and the nation as a whole. While it is certainly true that most of the economic effects of a mine located in a small town and rural area will be felt outside of the mine area, it does not mean that the estimated impact on that local area is irrelevant or should be ignored. The most direct and concentrated impacts associated with the mine will be felt in the area immediately around the mine. It is important for those communities to understand what the impact will be on *them*. Knowing that there might be a huge positive impact on the nation or the state as a whole may not tell the local governments and residents in the area immediately around the mine what the impacts will be on them. That is the reason we have identified a local study area and estimated the likely impacts, including impacts on tax revenues flowing to the actual local government units.

An economic *impact* analysis that looks instead at the nation as a whole or the state as a whole will, of course, generate a bigger value for this type of benefits-only calculation.

That may be good for mine's public relations efforts, but does not inform us about how those impacts are distributed between the local area and the much larger economy.

In Pollack's tables showing the tax revenue impacts associated with mine-related workers spending their incomes and suppliers serving the mine ("secondary tax impacts) there are lines labeled "county" and "local." As pointed out, these refer to statewide impacts, not impacts on the counties and municipalities in the vicinity of the mine. "County" refers to all 15 county governments in the state and "local" refers to all 92 incorporated municipalities in the state. If, instead, we focus on the projected impacts on Pinal and Gila Counties and the six incorporated towns in our nine-zip-code "Greater Superior" study area, we see dramatically lower "county" and "local" impacts.

As will be discussed below, in order to estimate the impacts of workers' expenditures on local tax revenues, we have to make an assumption about where the mine workers will live. The Pollack Report recognizes that most of the mine workers will live at some distance from the mine and commute in to the mine to work. With the suburbs of Phoenix just to the west of the mine many of the workers are likely to come from those communities. We have used the IMPLAN model to indicate the limited ability of the small towns in our local study to provision the mine and its workers. It indicated that only about a quarter of the total indirect and induced impacts of the mine could be served by businesses in our nine-zip-code study area. We assume that about the same percentage of the mine work force will actually live within our local study area. We estimate that about 340 of the 1,430 mine workers will live in the local study area.

Using these IMPLAN results for our local study area, the flow of tax revenues to the "county" is not almost $5 million dollars per year as Pollack concluded. It is $79,000 for Pinal and Gila Counties together. Instead the flow of tax revenues to "local governments" being over $6 million per year, the impact spread over all six incorporated towns in the vicinity of the mine would be about $5,000 per year. The total "secondary" tax revenue flows to the actual local governments in the mining area due to the mine would about $84,000 per year not almost $11 million. See Table H below

Table H.

County and Municipal Tax Revenues Associated with Supplier and Worker Spending: Resolution Mine Sum of Tax Revenues from Direct, Indirect, and Induced Impacts							
Elliot D. Pollack & Company							
Local Government Units	Employees Sales Tax	State Shared Sales Tax	Income Tax	Resident Property Tax	Vehicle License Tax	HURF Tax	Sum of Secondary Tax Revenues
All 15 AZ Counties	$868,750	$596,875	$0	$2,845,313	$231,250	$287,500	$4,829,688
All 92 AZ Incorporated Municipalities	$1,737,500	$370,313	$650,000	$2,696,875	$332,813	$346,875	$6,134,375
Total Local Government Tax Revenues	$2,606,250	$967,188	$650,000	$5,542,188	$564,063	$634,375	$10,964,063
Power Consulting, Inc.							
Local Government Units	Employees Sales Tax	State Shared Sales Tax	Income Tax	Resident Property Tax	Vehicle License Tax	HURF Tax	Sum of Secondary Tax Revenues
Pinal & Gila Counties	$ 14,719	$ 10,128	$ -	$ 45,868	$ 3,728	$ 4,635	$ 79,077
6 Towns in 9 Zip Code Local Area	$ 1,324	$ 283	$ 502	$ 1,955	$ 241	$ 251	$ 4,557
Total Local Government Tax Revenues	$ 16,043	$ 10,410	$ 502	$ 47,823	$ 3,969	$ 4,886	$ 83,634
Source: See Appendix							

Power Consulting_Table 9 recreation_7_16_2013_DSP, Power table 9 recreation, T31

iii. Direct Property Tax Payments by the Resolution Mine

There is one primary tax impact that *does* have a significant impact on local government, namely the property tax that would be paid by Resolution Copper to Pinal County. Pollack estimates that at $27.8 million per year. The Pinal County Budget for FY 2012-2013 (all funds) was $334.5 million. The projected property tax payments by Resolution would represent an 8.3 percent increase in funds available. Pinal County had 375,800 residents in 2010, most of them living in the Phoenix suburbs. The population of our 9 zip code study area that was in Pinal County was about 10,000, only 2.6 percent of the total Pinal County population. If the Superior, Hayden, Kearny, and Winkelman areas can make claims on that property tax revenue from Resolution proportional to the population of these towns, they would see $732,000 per year from those Pinal County property taxes paid by Resolution. Whether this represents a major benefit to residents in eastern and southern Pinal County will depend on the extent to which demands on public services rise significantly because of the proposed mine and the accompanying increased in-migration, in-commuting, use of roads, etc. These could impose significant additional costs on the Pinal County government offsetting some or all of the “benefit” of the increase in tax revenues.

F. The Impact of Fluctuating Production and Employment on Tax Payments

The Pollack Report assumes that the Resolution Mine's production and employment will follow a relatively constant path across the projected 50 years of operation. As discussed in an earlier section, this is not how copper mines have ever operated. Production and employment have fluctuated substantially as the balance of supply and demand in international markets has fluctuated and the profitability of operating any given mine has changed as a result.

One need only look at the historical direct tax payments from Arizona's copper industry over the last 40 years to see the potential instability in the flow of these revenues to state and local governments. In 1974 the Arizona copper industry was directly paying about $460 million dollars a year in Arizona taxes (stated in constant 2011dollars). By 1978 that amount had tumbled to about $360 million. But that was just a prelude to a more catastrophic decline in Arizona copper industry tax payments to state and local governments. By 1986 those tax payments had plummeted to about $100 million, about a quarter of what they had been ten years earlier. Local and state tax payments by the copper industry rebounded over the next 10 years somewhat, rising to above $200 million per year in 1995. But that recovery did not last very long. By 2002 copper industry tax payments had fallen to less than $75 million per year, one-sixth of their peak level. By 2011those tax payments had again rebounded to about twice the 2002 levels, to about $167 million per year. See Figure M below.

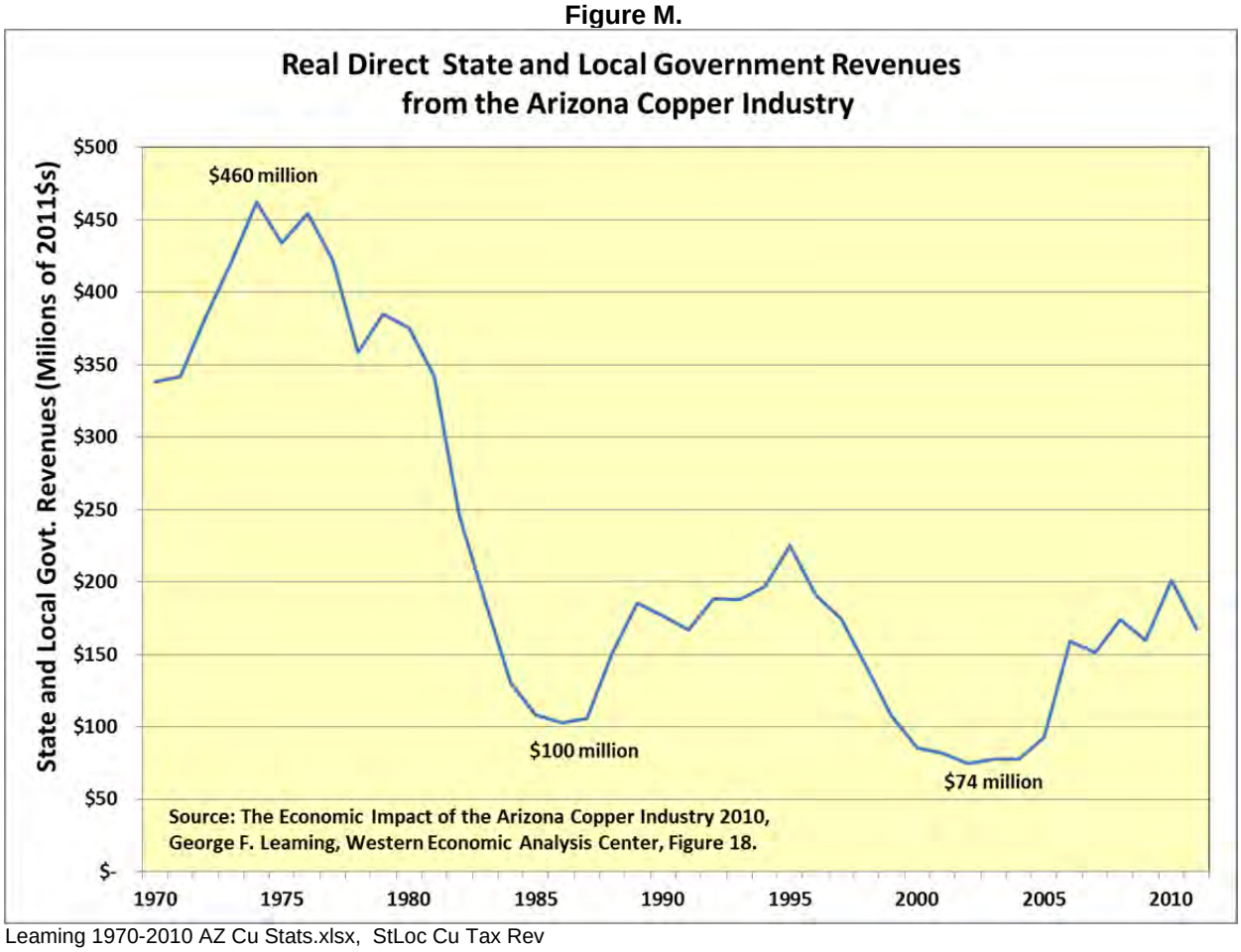
Such fluctuations in copper industry tax payments make it very difficult for state and local governments to plan their spending and balance their budgets. Increased economic activity requires increased government expenditures on public services. When copper production declines, the need for those public services does not decline but may increase. The tax revenues to support those expenditures on public services, however, may shrink dramatically. Simply stating the expected tax revenues at some hoped-for level of production stretching indefinitely into the future, as the Pollack Report does, is very misleading given the expected instability in those tax payments.

G. Impact of the Proposed Mine on Local Government Fiscal Balance: Conclusions

The multi-billion dollar fiscal benefits that the Pollack Report estimates will flow from the building and operating of the proposed Resolution Mine are not an accurate indication of the impact of the proposed mine on the governments in the region of the mine. As discussed above the Pollack Report tax "benefits" results are misleading for several reasons:

- Fiscal analysis requires an analysis of both tax revenues and the cost of providing public services. The Pollack Report ignores the increased demand for and the cost of public services due to the construction and operation of the mine.

Figure M.



Leaming 1970-2010 AZ Cu Stats.xlsx, StLoc Cu Tax Rev

- The Pollack Report states tax revenues as the cumulative tax payments over a 64-year period. That grossly exaggerates the *annual* tax revenues, which is the appropriate economic measure.

- The Pollack Report focuses on estimated statewide and nationwide tax revenues, ignoring the impact on local governments where the mine would be located. This exaggerates the actual benefits that will be seen locally.

- The Pollack Report appears to be inconsistent in its analysis of the impacts of the proposed mine on population. For instance, Pollack assumes that many of the jobs will be taken by existing residents of the area or of Arizona while also assuming that it will be in-migrants from outside Arizona that will take the jobs. These alternatives have significantly different implications for the distribution of the benefits of the mine.

- When the focus is on the impact of the proposed mine on the local governments in the immediate area of the mine, the "Greater Superior area," the annual increase in tax revenues is quite modest and the impact on fiscal balance unknown because there is no analysis of the increase in demand for public services from local governments.

- The Pollack Report assumes relatively steady tax payments from the Resolution Mine over a fifty-year period. It does not take into account the fluctuations in production and employment and the associated tax payments. This makes the time profile of the Pollack tax payments misleading, exaggerating the value of those tax payments to local governments.

5. The Overall Distribution of the Value of the Mineral Production from the Resolution Mine

The Pollack Report projects that the proposed Resolution Mine will produce $41.3 billion worth of output over its estimated 64 years of exploration, development, ore production, reclamation, and shutdown. Translated into the average annual value of production, that would be $645 million. These are obviously very large numbers. They confirm that considerable wealth will be created by the mine.

One of the important questions in terms of economic impact and stimulation of local economic development is how this economic value is likely to be distributed geographically. That is, how much of it is tied to local economic activity, how much of it is distributed across the entire Arizona economy, and how much of it quickly flows out of Arizona into the national and international economies.

This is not an unimportant consideration. As we saw with the projected impact of the Resolution Mine on tax revenues, very large tax payments were projected to be made by the Resolution Mine, almost $18 billion over the 64-year active life of the development and operation of the mine or $278 million per year. But $207 million of those tax payments or about three-quarters would flow directly to the federal government, not to local and state governments in Arizona.[50] The impact of those payments to the federal government would have little measurable impact on the local governments in the vicinity of the mine or the Arizona state government.

If we focus on the direct impact of the mine, that is, on payments flowing directly from the Resolution Mine, there are three primary flows: payroll being received by mine workers, tax payments to governments, and purchases of supplies to keep the mine operating. We can look at the distribution of these revenue flows among the immediate area around the mine, the rest of the state of Arizona, and the rest of the United States. We use our nine zip code area around the mine to define the local area.

[50] Pollack Report, Table B.

Of the total of $645 million annual value of production from the proposed mine, only about 4 percent of that value would flow to the local area around the mine as wages. Another 4 percent would flow primarily to Pinal County government where the mine is located in the form of property tax payments. A small revenue stream will also flow to actual local governments, e.g. the town governments within our study area. But Pinal County is a populous metropolitan county, part of the Phoenix metropolitan area. Because only about 3 percent of Pinal County's population lives in the local study area around the proposed mine[51], it is not clear how much of these property tax payments would find their way back from the urbanized part of the county to the rural and small town local area around the mine.

The small share of the total value of mine production flowing to wages in the local area is tied to the fact that modern mining is not very labor intensive. Mines, instead, are very capital intensive. The 14-year exploration and development schedule that Resolution has laid out and the highly automated nature of the proposed mine make that clear. In addition, as discussed earlier, most mine workers will not choose to live adjacent to the mine. Instead they will commute in to work at the mine.

The ability of the small towns in the local study area to serve the supply needs of the Resolution Mine would be quite limited. For instance, electricity is a major purchase made by copper mines. But it is unlikely that local electric generators would be constructed to serve the Resolution Mine. The electricity and other energy sources are most likely to be imported from elsewhere in Arizona or out of state. Major copper mines also contract for a broad range of technical services from professionals. Such contractors might possibly locate an office near the mine to facilitate the provision of those services. However, with the Phoenix Metropolitan Area just an hour's drive away, that is unlikely to be necessary. As a result, those technical support services will be purchased outside of the local study area. We do estimate that about $21 million in supplies will flow from the local study area to the mine each year. That represents a little over three percent of the total sales value produced by the mine.[52]

Much more of the value of mine output would flow to workers living outside of the local area. Twelve percent of the total value would be paid to Arizona workers living outside of the mine area, which is three times what is paid as wages to local area residents. Tax revenues flowing from the mine to Arizona government units outside the local area are

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[51] About 10,000 of Pinal County's 376,000 residents live in the contiguous zip code areas in the greater Superior area. Following the Pollack Report, we are only including property tax payments made directly to the county government.

[52] We have modeled the Resolution Mine as a copper mine producing $645 million in economic output each year as specified by Resolution and as also modeled in the Pollack Report. Copper mines often also produce small amounts of other metal ores such as molybdenum, gold, and silver. Rio Tinto, Resolution Copper's parent company reported the ore deposit that the Resolution Mine would develop has about 0.04 percent molybdenum. The copper concentration is 1.47 percent. (Footnote in "Resolution Copper Project Profile," http://resolutioncopper.com/wp-content/uploads/2012/08/RCM10585ProjectProfile.pdf) To the best of our knowledge, Resolution has yet to release a detailed feasibility study or mining plan that would allow a more detailed modeling of the proposed mine. These details might modify the profitability of the mine but are unlikely to change the local and state economic impacts.

somewhat smaller than those received by governments in the local area around the mine because of the large property tax payments made to Pinal County.[53] Significant supplies for the mine are purchased outside the local area elsewhere in the state of Arizona.

Most dramatic, about half of the total annual value of production would be paid out as profits, royalties, interest, dividends, profits, bonuses, and the self-employment earnings of individuals. It is likely that most of this part of the value flows out-of-state to those who invested in the mine, owned the mineral rights, or had other claims on the revenue flow from the mine.

This pattern of distribution of the value of output from the Resolution Mine is shown in Figure N below. Figure N shows that only about 12 percent of the total value of the minerals produced at the proposed Resolution Mine would be received by residents of the local study area around the mine. About a third of that value would be received by residents elsewhere in the State of Arizona. Over half of the value of output would flow to residents outside of Arizona.

VIII. Putting the Resolution Mine in the Context of the State and National Economy

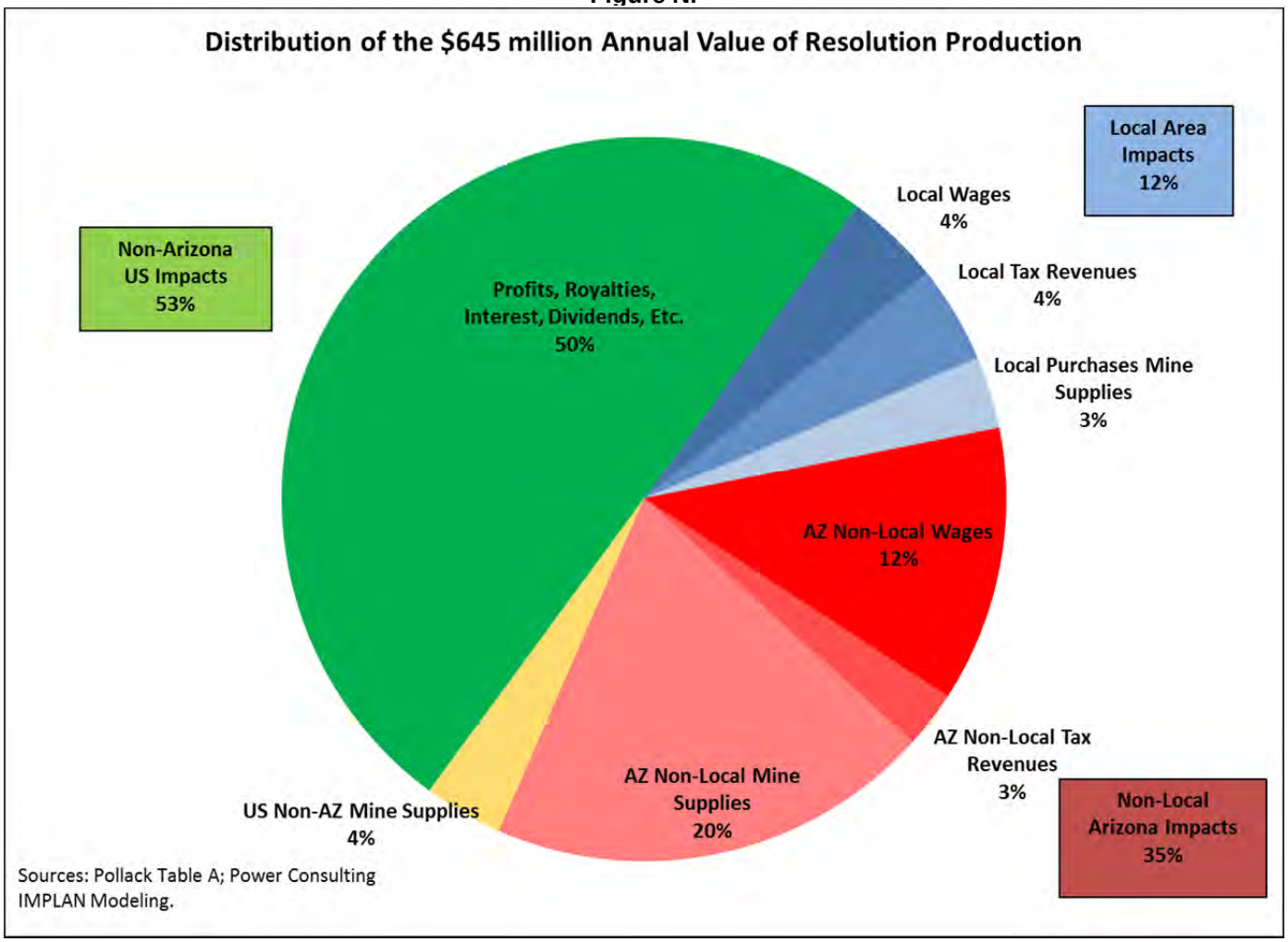
1. The Relative Size of the Resolution Mine within the Arizona Economy

Typically *economic impact* analysis generates impacts that appear so large that it is difficult or impossible for most people to put them into a context that allows them to evaluate how *important* they actually are. This is a typical advertising or public relations strategy aimed at exaggerating positive characteristics in order to get citizens' attention and, hopefully, their support, purchase, or vote.

The local area around a mine is usually the initial focus. Since most mines are adjacent to small towns or in rural areas, the very large estimated impacts *are* very large compared to those small local areas. But, of course, as was pointed out in the Pollack Report, most of the impacts actually are not felt in the local area but leak out to the state, national, or international economies. As a result it is easy to suggest that a mine will have a transformative impact at the local level because of the large size of its overall impacts, when, in fact, those impacts will be diffused over a much larger geographic area with much, much smaller relative impacts.

[53] Only taxes paid directly by the Resolution Mine to governments are included in the value of output. This includes property, sales, and severance taxes ("indirect business taxes"). Income taxes are not included since they are paid by those who receive wages, dividends, royalties, profits, interest, etc. In that sense those income taxes are already included in the value of the payments to individuals.

Figure N.



Distribution of Resolution Economic Value, Chart 2

In this section we try to put the statewide impacts that the Pollack Report estimated economic impacts into the context of the state economy. The Pollack Report ends by asserting that "From the State's perspective, [the Resolution Mine] would bring in yet another promising, long-term development to help catalyze Arizona's economic recovery and sustain its long term prosperity."[54]

The Pollack Report projects 1,429 direct jobs in mining and a total of 3,719 jobs when "multiplier" impacts are taken into account. In addition the mine's annual payroll would be $107 million per year, which balloons to $220 million per year with estimated multiplier impacts.[55] These are statewide impacts that might appear large enough to have a major impact on the Arizona economy.

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[54] Page 21.
[55] Table 16.

For reference, however, we have to note that in 2011 there were 3.2 million jobs in Arizona with payrolls totaling $164 billion. Within the Pollack Report's statewide geographic reference, the Resolution Mine's projected impacts are not all that impressive, one-tenth of one percent of the total state economy. That cannot possibly have a transformative impact on the state's economy.

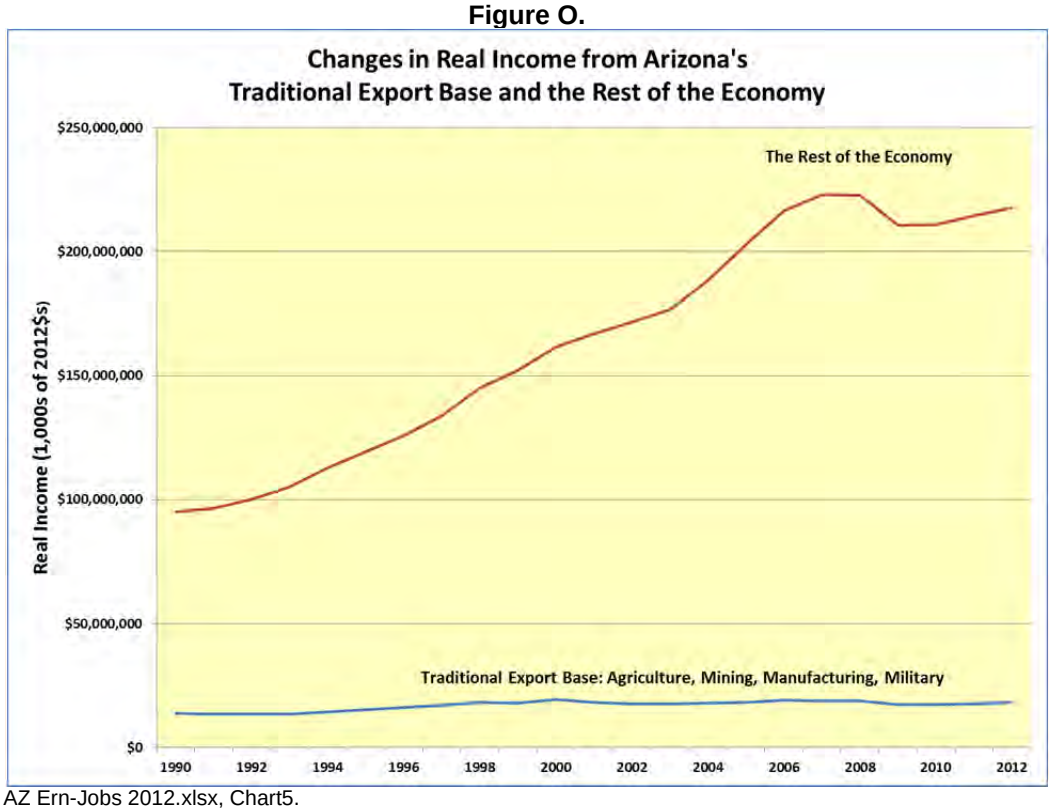
Alternatively, we can provide some context by looking at the rate at which jobs have been added to the Arizona economy over the last 20 years or so from 1990 to 2011, including the downturn associated with the Great Recession. On average over that period, the Arizona economy added 63,500 jobs per year with an annual increase in payroll of $7.4 billion per year. The Resolution Mine would have contributed about 6 percent to one year's average growth in jobs and 3 percent to one-year's average growth in payroll. That is, the mine, despite its size, would make, at best, a modest contribution to economic growth for one year.

2. Copper, Cattle, and Cotton Are No Longer the Source of Arizona Economic Vitality

It is important to understand that the Arizona economy has shown significant economic vitality over the last two decades despite three recessions, including the Great Recession. This economic vitality has come despite the loss of 23,000 jobs in manufacturing and 4,000 jobs in the military and slow growth in both mining and agriculture. The economy was able to continue to expand despite the stagnation or decline in its traditional export base. See Figure O below. Clearly there have been much more powerful sources of economic vitality in the Arizona economy than that coming from the traditional export base.

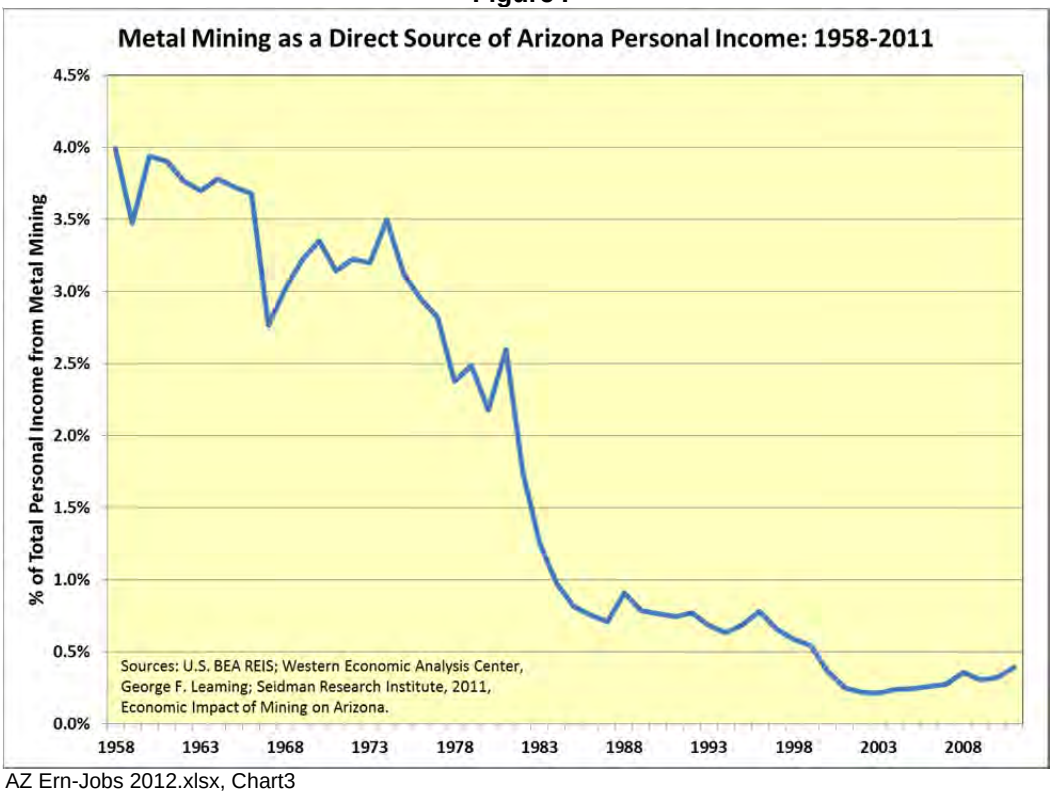
Over the last half-century, metal mining has been a declining source of Arizona personal income. In 1958 metal mining was the direct source of 4 percent of personal income. In 2012 it was the source of four-tenths of one percent of personal income, one-tenth of its previous direct contribution to the economy. See Figure P. Because the Arizona economy continued to expand even though the metal mining industry was in a state of collapse, metal mining's relative importance in the overall Arizona economy shrank dramatically, by a factor of ten. The same is true of the relative importance of metal mining as a direct source of jobs in the Arizona economy. See Figure Q.

Figure O.



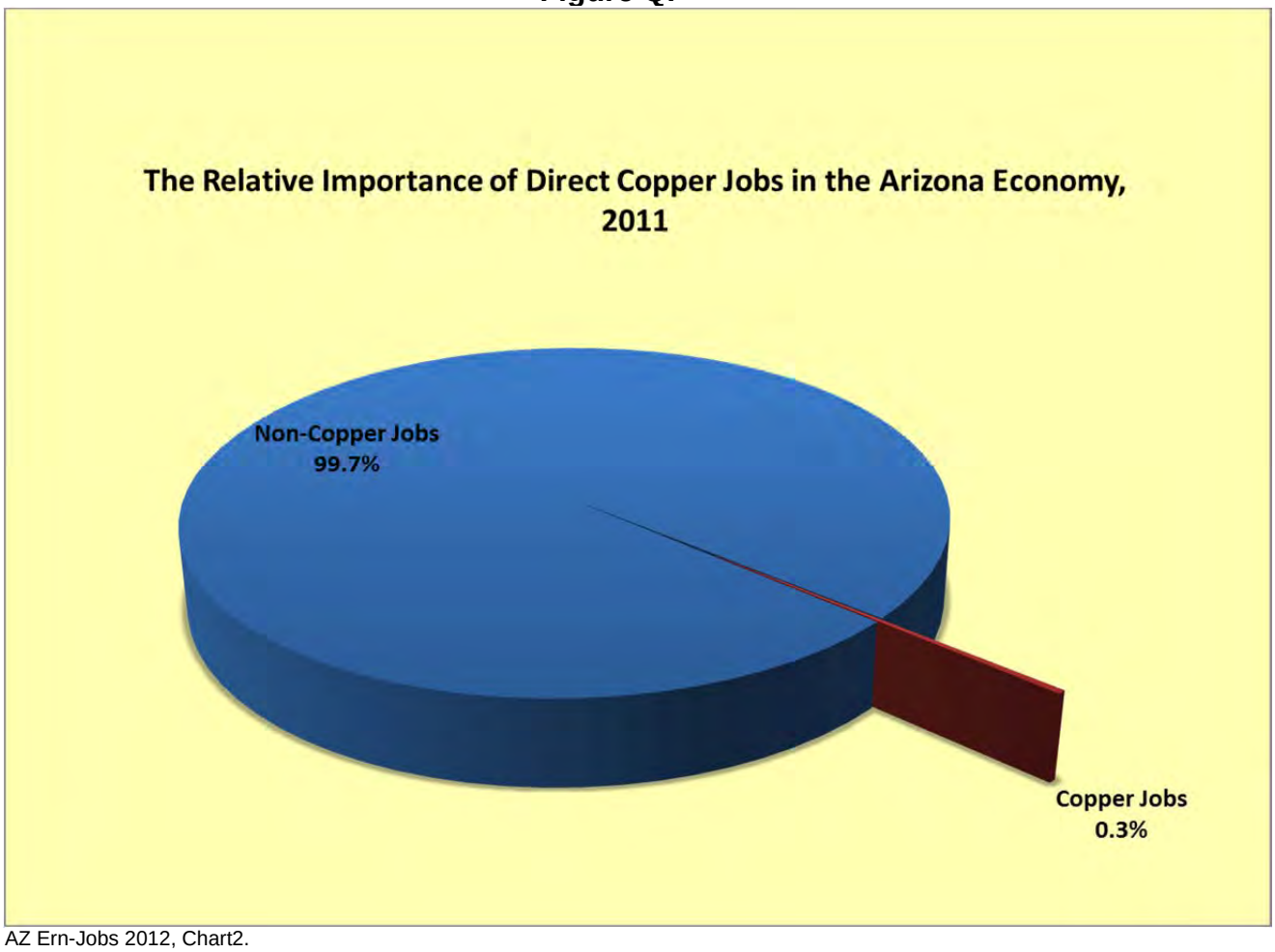
AZ Ern-Jobs 2012.xlsx, Chart5.

Figure P



AZ Ern-Jobs 2012.xlsx, Chart3

Figure Q.



AZ Ern-Jobs 2012, Chart2.

3. The Actual Sources of Job Growth and High-Paid Jobs in Arizona

Over the last two decades, despite the disruption of three national recessions, including the most recent one that was the worst since the Great Depression, Arizona was able to continue to generate substantial additional jobs at relative high pay, but in industries quite far removed from Arizona's traditional export base tied to "copper, cattle, and cotton."

Between 1990 and 2011 the Arizona economy added about 44,000 new wage and salary jobs *each year*.[56] Over 80 percent of that annual increase in new wage and

[56] This time period was chosen because U.S. BEA changed the way employment and labor earnings were reported by industry from the Standard Industrial Classification (SIC) to the North American Industrial Classification System (NAICS) in 2000. The earlier SIC data was not reassigned to the new industrial categories except for the 1990-2000 period. For that reason, the longest historical data series we have for employment and earnings by industry is for 1990 through 2011. Wage and salary employment was chosen because many self-employment jobs are clearly part-time or secondary jobs

salary jobs was accounted for by industries with above average pay in 2011. For instance, health care was adding about 9,500 jobs per year. Professional, scientific, and technical services were adding 5,400 jobs per year. Local, state and federal governments were adding 6,300 jobs per year. See Table I below.

The average annual pay associated with these different industries that were adding jobs at a relatively rapid pace in the 1990-2011 period ranged from $78,000 in wholesale trade to $54,000 in Finance and Insurance. The average pay across all of the rapidly growing, relatively well-paid, jobs was about $62,000 per year in 2011. The average pay across *all* Arizona wage and salary jobs was about $57,000. See Table I below.

Table I.

Job Creation in Arizona 1990-2011

Industry	Average Jobs Created Each Year 1990-2011 in Arizona	Average Pay Per Job 2011
Health Care	9,485	$58,089
Government: Local, State, Federal	6,325	$66,602
Professional, Scientific, & Technical Services	5,370	$62,656
Finance & Insurance	5,158	$53,889
Other Services	3,552	$59,869
Construction	2,397	$56,115
Transportation	2,013	$55,545
Wholesale Trade	1,778	$78,008
Total of Above: Growing, Well-Paid Jobs	36,077	$61,383
All Wage & Salary Jobs	43,738	$57,327
Source: U.S. BEA REIS		

AZ Ern-Jobs 2012.xlsx, AZ Jobs 1969-2012, AK262.

Of course all new job growth in Arizona over the last two decades was not in jobs paying above average pay. There was significant growth in the relatively low-paid sectors such as child care, retail trade, accommodations, food service, entertainment, and recreation. There was also shrinkage in other relatively high-paid jobs such as mining and manufacturing. The important point is that relatively well-paid jobs continued to be created despite the shrinkage in employment in the historic export base industries. Arizona had tapped into new sources of economic vitality.

Some have changed the “three C’s” of “copper, cattle, and cotton” into “four C’s” by adding “climate,” in particular, sunshine. This recognizes the role that in-migration in pursuit of a perceived high quality of life played in energizing the Arizona economy. That in-migration included both working-age families as well as retirees. Sunshine or climate

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with much lower annual labor earnings per jobs. About 22 percent of all Arizona jobs involved self-employment with an average pay per job in 2011 of about $26,000 per year. For wage and salary jobs the average pay per job was about $57,000 per year.

was not the only Arizona-specific quality that drew new people and economic activity to Arizona. Other site specific characteristics, typically labeled “amenities,” also supported the relocation of economic activity to Arizona since the end of the Second World War, which include open space, new cities, small towns, recreational opportunities, and recognition of the beauty of desert landscapes. People were at least partially moving to where they wanted to live rather than just moving to where jobs had traditionally been found.

Such amenity-supported economic development has been an important source of economic development throughout the Western states. In fact, almost all areas of the nation that are concerned about their economic future now regularly pay attention to how attractive they are in terms of the amenities supporting quality of life. Because of the increased mobility of both people and businesses, the perceived attractiveness of an area as a place to live and raise a family has become an important determinant of how competitive different regions and urban areas are in both retaining and attracting new residents and businesses.

To the extent that a proposed industrial project threatens the natural and social amenities of a particular area, that project is likely to be incompatible with a whole range of residential and business choices and the quality of life that can be an important source of future economic vitality. That is, some economic activities are incompatible with other economic values and activities. One set of activities can proceed only at the expense of the other. That is one of the important reasons that economic impact analysis has to recognize negative impacts as well as positive impacts of particular industrial projects if it is to assist the public in making a determination on how best to manage the surrounding natural landscapes.

4. The Potential Impacts of the Resolution Mine in a National Context

It is odd that Pollack’s economic impact analysis would estimate the impact of a particular mining project in rural Arizona on the national economy. It would seem obvious from the start that any particular proposed mine could not possibly have a significant impact on the national economy, which Power Consulting shows below is in fact the case.

The estimation of the impact of the Resolution Mine on the national economy only makes sense if one is trying to come up with the largest number possible for the “value” of the proposed mine. That is, it makes sense only from a public relations point of view.

The Pollack Report does *not* estimate the employment, labor income, and output impacts on the national economy. The only national projection it provides is for the tax payments the Resolution Mine would make to the federal government. That is estimated to be over $14 billion, about 71 percent of all the tax payments the Resolution Mine is projected to make to governments.

This Resolution estimate of the impact, as discussed earlier, is a sum of tax payments over all 64 years of planning, development, operation, and reclamation of the mine site. The *annual* federal tax impact that the Resolution Mine is projected to make to the federal government is $220 million.[57] In fiscal year 2013, the federal government collected $2.7 *trillion* in direct revenues while spending $3.7 billion.[58] The Pollack Report's estimate of the federal taxes that Resolution would pay represents about one-thousandth of one percent of federal revenues and even less of total federal spending. The Resolution Mine would contribute about one out of every twelve thousand dollars of federal revenues.

Clearly this is not a significant number to consider at the national level. The only reason the Pollack Report calculates it is that it increases the total taxes paid by the Resolution Mine from the about $5 billion paid to local, county, and state government to about $20 billion when federal taxes are included. Expressed in the only terms such payments make sense, the *annual* tax payments, including the federal tax payments raises the annual tax payments from the Resolution Mine from about $90 million to $311 million per year. This allows the Pollack Report to state what appears to be an incredibly large number, but a number, which, in the national context, is actually quite insignificant. This sort of calculation does not provide useful information for either citizens or public decision-makers**.**

IX. Summary and Conclusions

As explained in detail above, the preceding analysis supports the following conclusions about the economic impact analysis prepared for Resolution Copper by Elliott D. Pollack & Company.

1. Resolution's economic impact study *assumed* that the mine would produce only benefits. The study *imagined there* would be no costs associated with the mine.

Despite being labeled an *economic* impact study, that study chose to look only at the **positive** impacts associated with the mine. The Pollack Report explicitly states that it assumed that there will be no environmental costs associated with the proposed mine and that the construction and operation of that mine would not conflict with any other economic activities or values. This assured that the study would be a "pure benefits" analysis. The proposed mine, in effect, was assumed to be a "free lunch," which violates the economic convention to avoid such fantasies.

[57] Table 16, p. 20.
[58] http://www.usgovernmentrevenue.com/fed_revenue_2013US

2. Resolution's economic impact study ignored the historic volatility of copper mine operations in Arizona and elsewhere and *assumed* that the proposed mine would operate at a constant level of production for half a century.

As all the history of actual copper mining in Arizona and elsewhere has repeatedly demonstrated, copper mine production, employment, payroll, and tax payments fluctuate widely from decade to decade due to changing international metal market conditions. Resolution's projections assume that "this time will be different," despite a century and a half of evidence to the contrary. Resolution's study provides no evidence as to why anyone would expect that the volatility within the copper industry in the past would not continue into the future. That volatility in copper production, employment, payroll, and tax payments regularly disrupts households, communities, and governments. This is a significant cost associated with copper mining.

3. Historically, the jobs associated with metal mining and the high wages associated with mining jobs have not reduced unemployment nor boosted local economic vitality.

As the Town of Superior has discovered, Resolution's hiring of hundreds of workers did not lead to declining unemployment rates. Instead unemployment numbers and rates skyrocketed as more people moved in than there were jobs available. The region surrounding the proposed Resolution Mine has more than a century of history with copper mining. That has not been a history of sustained prosperity and economic vitality. There are important lessons to be learned from that experience that should inform public decisions about the proposed Resolution Mine.

4. Resolution's proposal to adopt an automated and robotic technology to mine its copper ore deposit will reduce the blue-collar jobs that local residents can fill and shift the mining workforce towards a smaller but more highly skilled set of workers.

Over the last half-century technological change in copper mining has consistently displaced workers, systematically reducing the number of workers required for any given level of copper production. Even when copper production has been rising, employment in copper production has been falling. That technological change has not come to an end. Resolution's automated and robotic approach to mining its ore deposit will reduce the number of workers needed and shift the remaining workforce away from blue-collar workers towards more highly skilled workers who can operate the mine remotely and maintain the computer controlled automated mining systems. This technical work force will not necessarily be located at the mine site.

5. Resolution's economic impact report recognizes that most of the economic benefits will <u>not</u> flow to the region immediately around the proposed mine but will flow to the rest of the State of Arizona and the nation.

The Resolution economic impact study was carried out on a statewide and national basis because so many of the projected benefits were expected to be primarily felt outside the small town and rural area in which the mine would be located. For instance, 71 percent of the projected tax flows to governments would go to the federal government, not to Arizona units of government. Resolution's economic impact study did not analyze the economic impacts to the local area where the mine would be located. This study *does* focus on those local impacts.

6. Copper mining is very land and environment intensive, causing significant degradation of natural landscapes and the potential for serious pollution problems. These environmental impacts have significant long-run economic implications.

Mining tends to displace most other economic activities in the region around the mine. The spectacular environmental degradation combined with the instability associated with mining operations actually discourages individuals, families, and businesses from locating in mining towns. That is why mining communities tend to be so specialized in mining, lacking in the economic diversification that can stabilize communities in the face of commodity price fluctuations. People and businesses are not drawn to mining areas except for the job opportunities. When those job opportunities "flicker" or disappear, residents and businesses disappear too. That is how "ghost towns" are generated.

Families and businesses are increasingly "footloose" in the sense of having choices as to where they locate. The "quality of life" associated with communities, their overall attractiveness as a place to live, work, and raise a family, are increasingly important for cities and regions to maintain a competitive edge in holding and attracting residents and economic activity. The landscape, environmental, and social costs associated with metal mining tend to discourage residential and business location.

7. Copper mining requires large quantities of water for processing the ore. Mining very deep deposits such as the Resolution ore body, requires the extraction of large quantities of ground water. The mining of sulfide copper ores causes serious water pollution problems such as acid mine drainage that can require water treatment in perpetuity. All of these water problems tend to displace other current and future economic activities.

The Resolution Mine will be located in a very arid region where available water resources already constrain economic activity. The mine will increase competition for water, diverting water from existing uses to mining while at the same time drawing down the local water table to remove ground water from the area around this deep ore deposit. In addition, over time, the mine site is likely to become a source of dangerously

polluted water. This makes it unlikely that the Resolution Mine can contribute to sustainable economic development in the area around the mine.

8. The Resolution economic impact analysis grossly exaggerated the positive economic impacts associated with the proposed mine.

i. Instead of reporting the annual level of various projected impacts, the Resolution analysis *summed* the annual impacts *over a 64-year period* and reported that cumulative number as the impact. That is how multi-billion dollar impacts were derived. This makes as much sense as reporting that each mining job was projected to pay $3.8 million dollars instead of saying that the annual pay associated with the jobs would be $75,000 and the mining was projected to last 50 years. Many of Resolution's economic impacts are 64 times too large.

ii. Consistent with a "free lunch" approach to economic impact analysis, the Resolution analysis of fiscal impacts assumes that the mine, its operations, its workforce, and all of the "multiplier" impacts on economic activity would **not require any** public services such as roads, road repairs, police and fire protection, education for children, social services, etc. According to Resolution's impact analysis, the new economic activity would generate taxes but absolutely no demand for expanded public services or degradation of existing public services because of increased use.

iii. A statewide and nation-wide stance was taken, rather than a local stance. That approach allowed for much larger impacts to be estimated, which is misleading.

iv. Copper production, employment, payroll, or tax revenues were assumed to be constant over a fifty-year period. None of the downward fluctuations that have plagued the industry for a century and a half were included in the projections.

9. The local economic impacts on the region surrounding the proposed mine would be only a fifth to a quarter of the size of the statewide impacts the Resolution study projected.

If one applies the same economic impact model that Resolution's consultant used but focus that economic model on the region surrounding the mine rather than on all of Arizona or the entire nation, the projected impacts are a small fraction of what the Pollack Report estimated.

The flow of tax revenues to the local governments within our local study area was even smaller relative to the huge tax flows estimated for all of Arizona by the Resolution economic impact analysis. While Resolution's contractor estimated millions of dollars in

enhanced revenue flows to governmental units, our estimates for the local study area are in terms of thousands of dollars. Our report shows similarly very modest impacts on tax revenues when employee payments of sales taxes, local government sharing of state sales taxes, income taxes, residential property taxes, etc. are taken into account. See Table E in the main body of the report.

Besides the Resolution Mine having only modest impacts on the flow of tax revenues to local government in the vicinity of the mine, those tax revenues will fluctuate with mine production in the future just as they have in the past. The unstable and unreliable character of these tax flows reduces their value to local governments.

10. Most of the value created by the Resolution Mine will flow out of state. Very little of it will stay in the region where the mine and its environmental and social impacts will be most directly felt.

Only about 4 percent of the mineral value produced by the proposed mine would flow to local residents in the form of local wages. About one-eighth of the total value of output would affect the local study area. About a third of the value of total mine output would impact the state as a whole. Over half of the value created would flow out of state to national and international investors.

11. The Arizona economy has not significantly depended on copper mining as a source of economic vitality for almost a third of a century. The Arizona economy has diversified significantly beyond the traditional "copper, cattle, and cotton" historical economic base. Good public economic policy cannot be based on an understanding of the Arizona economy that relies on a view through the rear-view mirror.

Over the last half-century, the direct contribution of metal mining to the total personal income received by residents of Arizona declined from four percent to *four-tenths of one percent*. That is, metal mining's importance as a source of income for Arizona residents fell to a tenth of what it used to be. In 2011 only three-tenths of one percent of Arizona jobs were in the copper industry. Despite that relative and absolute decline in the role of metal mining in the Arizona economy, the state economy was able to expand steadily until the Great Recession struck the entire nation.

In developing informed public economic policy in Arizona this successful diversification of the Arizona economy has to be analyzed in order to determine which economic activities are most likely to be providing jobs with reasonable pay in the future. Looking back at the distant past is not very useful in recognizing the structure of the contemporary and future economy.

Over the last two decades many sectors of the Arizona economy have been creating thousands of relatively high-paying jobs *each year*. Rather than looking backward at Arizona's colorful past in copper mining for sources of economic vitality, public economic policy should be analyzing the powerful economic forces that have been creating these tens of thousands of new jobs year after year.

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Appendix

IMPLAN Modeling of Power Consulting's Nine-Zip-Code Contiguous Local Study Area

IMPLAN modeling

To model the economic and fiscal impacts of the proposed Resolution Copper mine, Power Consulting used the same model (IMPLAN) that Pollack used. Power Consulting used the same values for direct employment, wages, and economic output that Pollack obtained from Resolution and used for the Pollack Report.[59] Power Consulting sought to replicate the modeling that Pollack had previously done to test the outputs of Pollack's modeling and check that the multipliers were not inflated to produce more impacts than could reasonably be projected. We found that there were some significant deviations from normal practice that tended to distort the results reported in the Pollack Report.

First, the impacts that Pollack projected are on a 64 year time frame. Historically no copper mine has run continuously, at constant production, for 64 years. Even if the mine could run continuously for the 64 year time frame, presenting the impacts in this way obscures the impacts that are likely to be seen on an annual basis which is the time frame that typically is used in reporting economic impacts. No single person could reasonably assume that they would work at the mine for 64 years. Presenting the sum of the wages that one person might earn over a 64 year time frame obscures the reality of the employment and the impacts of that employment. For example, a person who makes $50,000 a year for 64 years would be paid $3.2 million over that 64-year period, but no employer ever describes a job in this fashion. It is far easier to understand the impacts of the proposed mine on an annual basis since this is the standard convention that potential employers use when describing a job or project. Because of this, Power Consulting chose to present the impacts on an annual basis instead of over the projected life of the mine.

Second, the modeling that Pollack did was based on the state of Arizona. This means that besides the direct impacts that are associated with the employment and production at the proposed Resolution Mine site, all of the impacts are spread out over the state of Arizona. Even the direct employment cannot be considered to be local. Although the 1,400 plus directly employed people will be working at the proposed mine in the IMPLAN model runs, this does not mean that they will live in the local area. Where

[59] Resolution Copper Company Economic and Fiscal Impact Report Superior, Arizona. September 2011.

people live and spend the wages has a dramatic effect on the secondary impacts (induced and indirect)[60] that are triggered by the direct impacts.

Although the State of Arizona could benefit from the secondary jobs that may be created by the proposed Resolution copper mine, the people that live near the mine will see very few of these impacts as the money leaks out of the local area to the metropolitan areas of Arizona, especially the Phoenix Metropolitan Area in which the Resolution Mine site is located.[61] Because of this leakage to the metropolitan areas, we chose to focus our modeling on a much more local area surrounding the mine (9 contiguous zip-codes that together make up a truly local area).[62] This truly Local[63] focus allows IMPLAN to look at not only the employment and compensation associated with the proposed mine on the Local area, but also the tax impacts that the Local area will see coming back to it.

Third, the most dramatic over-representation that Pollack and Company produced was in the tax impacts. Not only were the taxes presented for 64 years, but the labeling of the tax's destinations was extremely misleading. Pollack reports tax flows using the words "county" and "local," suggesting that the Pollack Report is focused on the counties and local towns in the immediate vicinity of the mine. But these labels have little connection with Gila and Pinal counties and even less to do with the Local study are that we have defined. In the Pollack report, "county" is taken to mean all of the counties in the state of Arizona and "local" is taken to mean all of the incorporated cities and towns in Arizona. Since many of these taxes are distributed to these governments based on population, and since Gila and Pinal counties as well as our Local study area have a very small percentage of the statewide population, only very small fractions of the annual fiscal impacts will come back to the counties and the Local area around the mine. To attempt to present the fiscal impacts that Gila and Pinal counties as well as the Local area will likely receive on an annual basis, we have separately labeled and modeled each on a Local area basis rather than Pollack's focus on the entire state.

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[60] Indirect effects are defined by IMPLAN as "The impact of local industries buying goods and services from other local industries. The cycle of spending works its way backward through the supply chain until all money leaks from the local economy, either through imports or by payments to value added. The impacts are calculated by applying Direct Effects to the Type I Multipliers." Induced effects are defined as "The response by an economy to an initial change (direct effect) that occurs through re-spending of income received by a component of value added. IMPLAN's default multiplier recognizes that labor income (employee compensation and proprietor income components of value added) is not a leakage to the regional economy. This money is recirculated through the household spending patterns causing further local economic activity." IMPLAN Glossary http://implan.com/V4/index.php?option=com_glossary&Itemid=57

[61] The Resolution Mine site is in eastern Pinal County. Although the area around the mine is rural with several relatively small towns, Pinal County is one of the two counties that make up the Phoenix Metropolitan Area.

[62] The zip-codes are 85135 (Hayden), 85137 (Kearney), 85173 and 85273 (Superior), 85192 (Winkelman and Dudleyville), 85501 and 85502 (Globe), 85539 (Miami), and 85550 (San Carlos).

[63] From here on "Local" will refer to the 9 zip-code area.

Details of the modeling: Employment, Labor Income, and Output

Power Consulting remodeled the impact of the Resolution Copper mine on an annual basis and a Local level. As described earlier, we ran our IMPLAN analysis on a "Local" 9 zip-code contiguous area instead of the State of Arizona as a whole. As inputs for the model we used the same direct employment, labor income, and economic output that Pollack used (i.e. the values provided by Resolution) to model their impacts (see figure below).[64] Power Consulting made no other changes to the model. The Resolution Copper mine was modeled as an industry change under sector 23 (Copper, nickel, lead, and zinc mining). Power Consulting used IMPLAN by M.I.G. version 3.0. All dollar values are presented in 2011 dollars (the same as Pollack) and all values are on an annual basis.

Table A-1

Local Area Impact Summary				
Impact Type	Employment	Labor Income	Total Value Added	Output
Direct Effect	1,429	$ 108,566,738	$ 471,966,866	$645,064,064
Indirect Effect	221	$ 17,179,349	$ 50,202,549	$ 87,860,373
Induced Effect	329	$ 11,535,315	$ 26,183,119	$ 42,338,615
Total Effect	**1,979**	**$ 137,281,403**	**$ 548,352,535**	**$775,263,052**

It is clear from the modeling presented in the table above, that the secondary impacts of the mine, on the Local area, are far smaller than Pollack presented. Although the Direct Effects are the same, the amount of money that circulates in the Local area and the jobs associated with that money are greatly reduced. This should come as no surprise since Pollack modeled the impacts on the state of Arizona as a whole. Although Arizona may be able to accommodate the needs of a highly mechanized and modern underground copper mine, the Local area around the mine simply cannot.

Details of the modeling: Fiscal Impacts

Fiscal impacts were modeled using Pollack's fiscal impacts scaled by our labor impacts (wages) and employment that were outputs from our IMPLAN modeling of the nine contiguous zip code Local area. We do not dispute the Pollack Report's "benefits only" analysis of the State of Arizona a whole over the 64-year life span of the mine. We do dispute the characterization of the impacts as going to "county" and "local" areas. As described above, we consider Gila and Pinal counties separately as well as the Local area surrounding the mine. In this manner we can show the impact that the people that live in the counties and Local area around the mine will actually see on an annual basis.

The modeling output of the direct inputs of employment, labor income, and economic output, allows us to predict the secondary impacts (indirect and induced) that can be

[64] Resolution Copper Company Economic and Fiscal Impact Report Superior, Arizona. Pollack and Company. Table 5. September, 2011

compared to Pollack's secondary impacts. Power Consulting used the average of the ratio of indirect and induced employment from our modeling of the local area compared to Pollack's statewide indirect and induced employment to scale the direct employment that Pollack present (see table below). This is done to estimate the number of people that are likely to be directly employed by the mine *and* live in the Local area (the local area is distributed between the two "local "counties: Pinal and Gila). The same methodology was applied to the labor income. It is important to note that this was done solely for the fiscal impacts and not for the modeling of employment, wages, or economic output. As can be clearly seen in the table A-2 below, the impacts of the mine on the local area are dramatically reduced. Both employment and labor income are about a quarter of Pollack's modeling of the state as a whole. The output is still significant in the local area largely because we are simply using Resolution's claimed level of employment, payroll, and value of output.

Table A-2

Power Consulting's Local Impacts Compared to Pollack Statewide Impacts

Local Results Compared to Pollack			
ImpactType	Employment	LaborIncome	Output
Direct Effect	24.0%	25.6%	100%
Indirect Effect	23.7%	30.0%	59%
Induced Effect	24.3%	20.6%	25%
Total Effect	**24.0%**	**25.5%**	**81%**

Once direct, indirect, and induced employment and labor income for the proposed mine were modeled, Power Consulting was able to allocate the fiscal impacts based on either the population or the labor income of the study areas.[65] In this way we were able to more accurately predict the fiscal impacts that will return to the local counties and Local area.

Primary Fiscal Impacts in the Local Area

Primary taxes are the taxes that are paid directly by Resolution to the state of Arizona, counties of Arizona, and incorporated cities and towns of Arizona. Power Consulting does not dispute the statewide benefits-only impacts presented by Pollack. Power Consulting does dispute the labeling of the taxes as county and local and presents the actual fiscal impacts of the Resolution Copper mine on the local counties (Gila and Pinal) as well as the Local area (see table below).

Severance tax: The severance tax is allocated at the county and local level based on population. The severance tax is collected by the state and allocated in the following manner: The state receives approximately 48% of the total, all of the counties in Arizona receive approximately 32% of the tax and each individual county is allocated its

[65] Not all fiscal impacts are dependent on employment or labor income which will be discussed in more detail below.

share of the county allocation based on population, and finally the incorporated cities receive 20% of the total severance tax and are allocated their share based on their population compared to the total incorporated cities population in Arizona.[66] Gila County has approximately 0.838% of the total state population; Pinal County has approximately 5.879% of the state population; and the local area has approximately 0.302% of the incorporated cities populations in Arizona.[67] The population of each county (Gila and Pinal) as well as the population of the local area was used to scale the Pollack Report's distribution to county and local areas, respectively.

Corporate income tax: 15% of the corporate income tax is distributed to incorporated cities and towns and the state of Arizona collects the other 85%.[68] Corporate income tax is not distributed at the county level. It is distributed at the city level based on the share of the population that each city has compared to the total state population of incorporated cities and towns. Power Consulting scaled the distribution of the Pollack Report's local impacts based on the population of the local area.

Property tax: Property tax is paid directly to the county.[69] Power Consulting presents the same property tax that the Pollack Report presented. Pollack describes this value as having come directly from Resolution Copper as…"economic and fiscal impacts are based on assumptions prepared by the client."[70] The property tax value does not include all of the property tax that would likely be collected from Resolution as school districts were left out since state "equalization" effort to assure all school districts have a certain level of revenue regardless of the local tax base can quickly make the modeling quite complicated[71].

Direct Utility Tax: Since no information as to the amount of electricity or gas that Resolution will use over the life of the mine was presented, we do not attempt to present a local impact of these taxes. Without some knowledge of the appropriateness of the amount of energy required to run the Resolution Copper mine, it is impossible to tell if these fiscal impacts are reasonable. It is unlikely that the local area could provide the gas or electricity that would be necessary to run such a large mine. As a result much of these fiscal impacts would leak out of the local area as the energy is purchased outside of the local area. Without specific information (such as a mining plan or Environmental Impact Statement) as to how much and where the energy was assumed to be purchased, the Direct Utility Tax is left out of our calculations.

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[66] State of Arizona 2011 Tax Handbook. Page 28. 2011.
[67] American Fact Finder. Census 2010. http://factfinder2.census.gov/faces/nav/jsf/pages/index.xhtml
[68] State of Arizona 2011 Tax Handbook. Page 70. 2011.
[69] State of Arizona 2011 Tax Handbook. Page 91. 2011.
[70] Resolution Copper Company Economic and Fiscal Impact Report Superior, Arizona. Page iii. September 2011.
[71] This is the same methodology that Pollack used.

Secondary Fiscal Impacts

The secondary fiscal impacts are the taxes that the people that are employed, either directly or indirectly, will pay to the state, county, and local areas. As with the primary impacts we break down the fiscal impacts into the two counties (Gila and Pinal) as well as the Local study area. Some of these taxes are allocated at the county and Local level based on the income of the Local residents paying the taxes (employee sales tax, state and shared sales tax, and income tax) and some are allocated based on the number of local people that are paying the tax (resident property tax, vehicle license tax, and HURF tax). Because not all of the people that are directly employed by the mine will live in the two counties or local area, we have scaled the direct employment in the manner that was described above.

Employee Sales Tax: Employee sales tax is distributed throughout the state in the following manner: 25% is paid to the cities in proportion to their population, 40.51% is paid to the counties in proportion to their population, and 34.49% is paid to the State.[72] Power Consulting scaled Pollack and Company's values in two different ways: First, as with some of the primary tax impacts the values were scaled based on the representative population of each category (Gila, Pinal, and the local area). Then each area was scaled based on the value of the direct, indirect, and induced labor income that Power Consulting estimated from its local IMPLAN modeling compared to Pollack's statewide modeling outputs. The scaling is a ratio of Power Consulting's secondary impacts compared to Pollack and Company's secondary impacts as described above. In this manner, we present the taxes that are paid by local residents to Gila and Pinal Counties as well as the local area itself.

State Shared Sales Tax: Allocated in the same way that employee sales tax was allocated.

Income Tax: Income tax is distributed to the cities and towns (15%) and the state as a whole (85%).[73] The city and town allocation of income tax is the same as described above for the employee sales tax for local allocation.

Resident property tax: Property tax for the workers employed by the mine (either directly or indirectly) is hard to calculate. Each taxing authority in the state of Arizona can, and generally does, levy a different property tax. In fact in 2009 the state of Arizona had 3,249 taxing authorities leveling different property taxes.[74] The lack of a consistent property tax rate is further complicated by our lack of knowledge of where each worker will live and how much each worker's property is worth. To try and ease the burden of a calculation with so many unknown variables we have chosen, as with the other fiscal impacts, to scale Pollack and Company's property tax impacts. They were scaled in the same way that the county and local employee sales taxes were scaled with one important difference: Instead of scaling them based on employee compensation they were scaled based on employment. Since each worker will

[72] State of Arizona 2011 Tax Handbook. Page 2. 2011.
[73] State of Arizona 2011 Tax Handbook. Page 31. 2011.
[74] State of Arizona 2011 Tax Handbook. Page 94. 2011.

assumedly pay property tax it is logical to scale the property tax off of the number of employees instead of employee compensation. Power Consulting's residential property taxes at county and local levels are representative of the populations of the counties (Gila and Pinal) as well as the Local area and the total number of people employed (directly and indirectly) that live in the local area.

Vehicle license tax: 45% of the vehicle license tax goes to the HURF tax, 30.4% goes to counties, and 24.6% goes to incorporated cities and towns.[75] The allocation of the vehicle license tax was done in the same manner as the Residential property tax.

Unemployment tax: Since the unemployment tax goes to the state of Arizona and none of it is given back to counties or local governments, we do not include that tax in our local analysis.

HURF tax: 50.5% of the HURF tax goes to the State Highway Fund, 19% goes to counties, 27.5% goes to incorporated towns and cities, and 3% goes to incorporated towns and cities with populations greater than 300,000 people.[76] The allocation of the HURF tax was done in the same manner as the Residential property tax.

In the tables below we present the full fiscal impacts that Power Consulting modeled. As with the description above, the tables are broken into annual primary and annual secondary revenues. The values are presented in 2011 dollars and it is important to point out that these are not in thousands or millions of dollars. Some of the taxes that will return to the Local area are less than $100 annually. Although the total revenues created do represent a little over 30% of Pollack's statewide tax calculations, the vast majority of that money is coming from the Property taxes that Resolution will pay to Pinal County which we did not scale even though most of it is unlikely to find its way back to the small towns and rural areas that surround the proposed mine. Many of the other fiscal impacts that are paid to the local counties and Local area are fractions of one percent of the value presented by Pollack and Company. This, of course, is because Pollack presented the impacts on the state as a whole and we are presenting the fiscal impacts on the local counties and Local area. Since the local counties and local area have such a small percentage of either population or wages, compared to the State of Arizona, only a very small percentage of the taxes levied come back to the local area.

[75] State of Arizona 2011 Tax Handbook. Page 176. 2011.
[76] State of Arizona 2011 Tax Handbook. Page 168-169. 2011.

Table A-3

Annual Primary Revenues				Annual Secondary Revenues from Employment						
Impact type	Severence tax	Corporate income tax	Property tax	employees sales tax	State shared sales tax	Income tax	Resident property tax	Vehicle license tax	HURF tax	Total revenues
Direct										
Gila	$ 32,990	na	na	$ 826	$ 574	na	$ 2,198	$ 179	$ 223	$ 36,989
Pinal	$ 231,292	na	$ 27,828,125	$ 5,790	$ 4,025	na	$ 15,410	$ 1,255	$ 1,563	$ 28,087,459
Local	$ 7,334	$ 12,143	na	$ 595	$ 128	$ 250	$ 750	$ 93	$ 96	$ 21,390
Total	$ 271,615	$ 12,143	$ 27,828,125	$ 7,211	$ 4,727	$ 250	$ 18,358	$ 1,527	$ 1,882	$ 28,145,838
Indirect										
Gila	na	na	na	$ 558	$ 385	na	$ 1,418	$ 115	$ 143	$ 2,619
Pinal	na	na	na	$ 3,913	$ 2,701	na	$ 9,939	$ 805	$ 1,000	$ 18,359
Local	na	na	na	$ 404	$ 86	$ 156	$ 485	$ 59	$ 63	$ 1,252
Total	na	na	na	$ 4,875	$ 3,172	$ 156	$ 11,842	$ 979	$ 1,206	$ 22,230
Induced										
Gila	na	na	na	$ 453	$ 305	na	$ 2,110	$ 172	$ 213	$ 3,253
Pinal	na	na	na	$ 3,179	$ 2,138	na	$ 14,793	$ 1,203	$ 1,493	$ 22,805
Local	na	na	na	$ 326	$ 68	$ 96	$ 720	$ 89	$ 93	$ 1,392
Total	na	na	na	$ 3,958	$ 2,511	$ 96	$ 17,623	$ 1,464	$ 1,798	$ 27,450
Total										
Gila	$ 32,990	na	na	$ 1,837	$ 1,264	na	$ 5,726	$ 465	$ 579	$ 42,861
Pinal	$ 231,292	na	$ 27,828,125	$ 12,882	$ 8,863	na	$ 40,142	$ 3,263	$ 4,056	$ 28,128,623
Local	$ 7,334	$ 12,143	na	$ 1,324	$ 283	$ 502	$ 1,955	$ 241	$ 251	$ 24,034
Total	$ 271,615	$ 12,143	$ 27,828,125	$ 16,043	$ 10,410	$ 502	$ 47,823	$ 3,969	$ 4,886	$ 28,195,518

Table A-4

Annual Primary Revenues			
Impact type	Severence tax	Corporate income tax	Property tax
Direct			
Gila	$ 32,990	na	na
Pinal	$ 231,292	na	$ 27,828,125
Local	$ 7,334	$ 12,143	na
Total	$ 271,615	$ 12,143	$ 27,828,125
Indirect			
Gila	na	na	na
Pinal	na	na	na
Local	na	na	na
Total	na	na	na
Induced			
Gila	na	na	na
Pinal	na	na	na
Local	na	na	na
Total	na	na	na
Total			
Gila	$ 32,990	na	na
Pinal	$ 231,292	na	$ 27,828,125
Local	$ 7,334	$ 12,143	na
Total	$ 271,615	$ 12,143	$ 27,828,125

Table A-5

Annual Secondary Revenues from Employment						
employees sales tax	State shared sales tax	Income tax	Resident property tax	Vehicle license tax	HURF tax	Total revenues
$ 826	$ 574	na	$ 2,198	$ 179	$ 223	$ 36,989
$ 5,790	$ 4,025	na	$ 15,410	$ 1,255	$ 1,563	$ 28,087,459
$ 595	$ 128	$ 250	$ 750	$ 93	$ 96	$ 21,390
$ 7,211	$ 4,727	$ 250	$ 18,358	$ 1,527	$ 1,882	$ 28,145,838
$ 558	$ 385	na	$ 1,418	$ 115	$ 143	$ 2,619
$ 3,913	$ 2,701	na	$ 9,939	$ 805	$ 1,000	$ 18,359
$ 404	$ 86	$ 156	$ 485	$ 59	$ 63	$ 1,252
$ 4,875	$ 3,172	$ 156	$ 11,842	$ 979	$ 1,206	$ 22,230
$ 453	$ 305	na	$ 2,110	$ 172	$ 213	$ 3,253
$ 3,179	$ 2,138	na	$ 14,793	$ 1,203	$ 1,493	$ 22,805
$ 326	$ 68	$ 96	$ 720	$ 89	$ 93	$ 1,392
$ 3,958	$ 2,511	$ 96	$ 17,623	$ 1,464	$ 1,798	$ 27,450
$ 1,837	$ 1,264	na	$ 5,726	$ 465	$ 579	$ 42,861
$ 12,882	$ 8,863	na	$ 40,142	$ 3,263	$ 4,056	$ 28,128,623
$ 1,324	$ 283	$ 502	$ 1,955	$ 241	$ 251	$ 24,034
$ 16,043	$ 10,410	$ 502	$ 47,823	$ 3,969	$ 4,886	$ 28,195,518