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THE BEDROCK OF CIVILIZATION

THE ECONOMIC IMPACT OF THE AGGREGATES INDUSTRY IN UTAH

Sales and Labor Income Show Large Effects on the State

THE BEDROCK OF CIVILIZATION

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EXECUTIVE SUMMARY

In 2018, Utah Foundation was commissioned by Clyde Companies, Kilgore Companies and Staker Parson Materials and Construction to analyze the impact of the aggregates industry in Utah. Aggregates generally consist of crushed stone, sand and gravel. Aggregates are essential in constructing stable subgrades for nearly every type of construction project and are constituents in asphalt and ready-mixed concrete.

In 2017, the aggregates industry directly employed over 100,000 individuals nationally, supporting nearly 600,000 total jobs.¹ The \$27 billion in sales in 2017 cascaded to drive a total impact of \$121 billion overall. In 2018, Utah's aggregates industry directly employed 1,620 individuals and supported a total of 3,410 jobs throughout the state. Aggregate sales of \$331 million drove a total of \$680 million in economic activity in Utah.

At the county level, Washington, Weber and Utah counties see large benefits, with the aggregates industry in each county supporting between 130 to 300 jobs and \$20 million to \$60 million in sales. Salt Lake County stands out from the rest, with the aggregates industry supporting a total of nearly 1,700 jobs and \$322 million in economic activity. Only three of Utah's 29 counties do not experience a direct impact from the aggregates industry. Twelve counties experience a small impact from the industry. Another 10 counties experience moderate impacts.

It is easy to conclude that Utah's diversified economy benefits from the presence of a strong aggregates industry, which provides local sources of construction and building materials. In addition, Utah benefits from the industry's high-wage jobs, which have a ripple effect through the rest of the economy.



KEY FINDINGS OF THIS REPORT

- Most (90%) aggregates are consumed within 50 miles of mining and production; shipping costs rise sharply with distance.
- The aggregates industry is present in 26 of Utah's 29 counties and has a moderate or larger impact in 14.
- Unlike many other industries where borders are fluid and companies can choose where to expand and contract, the aggregates industry is dependent on the location of the natural resources which are mined. The aggregates industry is strongly tied to local communities. In Utah, there are aggregate quarries in at least 23 of 29 counties.
- Utah's aggregate industry directly employs 1,620 individuals and generates \$331 million in sales.
- Utah's aggregate industry supports another 1,790 jobs, for a total of 3,410 jobs and \$680 million in economic activity statewide.
- Earnings for Utahns within the industry and from all jobs supporting the industry results in up to \$9.1 million in revenue for Utah through state income taxes.
- Sales within the industry and from all sales supporting the industry may generate up to \$31 million in sales taxes for the state and another \$10 million for local governments.
- The value of aggregates industry output has rebounded in recent years but has not yet returned to its pre-recession peak, when adjusted for inflation. This reflects national and regional trends.

INTRODUCTION

Aggregates are an essential – yet sometimes overlooked – necessity of modern life. Most people give little thought to aggregates, despite the 400 tons of aggregates it takes to build a typical modern house, the 15,000 tons of aggregates that go into an average school, and the 38,000 tons of aggregates needed for each line mile on a four-lane interstate highway.² Aggregates generally consist of sand, gravel and crushed stone. However, slag (what is left after a metal has been removed from its ore), recycled glass and other geosynthetic materials can also be included. While aggregates have a wide variety of uses, the majority are for construction. Others are used in everyday items such as paper, glass, medicines, fertilizer, cosmetics, toothpaste and chewing gum, and can play key roles in preventing erosion, purifying water and treating wastewater.³

Because of the vital role of aggregates in modern society, the true economic benefit to Utah's society would be difficult to calculate. Without aggregates, buildings would primarily be constructed of wood and metal, with no concrete or drywall available. Windows would be constructed from plastic as glass is a product of aggregates. Foundations would be less stable without aggregate subbase and concrete footings; multi-story buildings would be impossible to construct. Similarly, roads would be built of rough cobblestones as aggregates are the primary components of asphalt, concrete and road base.

Indeed, the lack of aggregates would likely have a far-reaching impact. It could even impact industries that most would not connect to aggregate mining – such as air travel. Without aggregates, airports would likely not have runway infrastructure that could support large aircraft. Air travel would be limited to smaller, less efficient (and consequently more expensive) airplanes.

Leaving such far-fetched scenarios aside, it is important to note that there are significant economic benefits to ensuring access to aggregates within Utah. And while it would be impractical to attempt to calculate the additional annual building costs that would be incurred were the industry not present in Utah, suffice it to say they would be significant. For instance, the costs related to shipping aggregates escalate dramatically with distance. That said, this report focuses on the factors traditionally used to assess economic impact: jobs and sales.

OVERVIEW OF THE AGGREGATES INDUSTRY

Aggregates are the most mined materials in the United States and are found across Utah. When looking at industrial mineral production, nearly half of the total amount produced in 2017 (\$49 billion) were from aggregates.⁴ In fact, both of the primary components of aggregates are on the list of the 13 mineral commodities valued above \$1 billion each.⁵ Aggregate components were the top mineral in terms of production value across 28 states in 2017.⁶

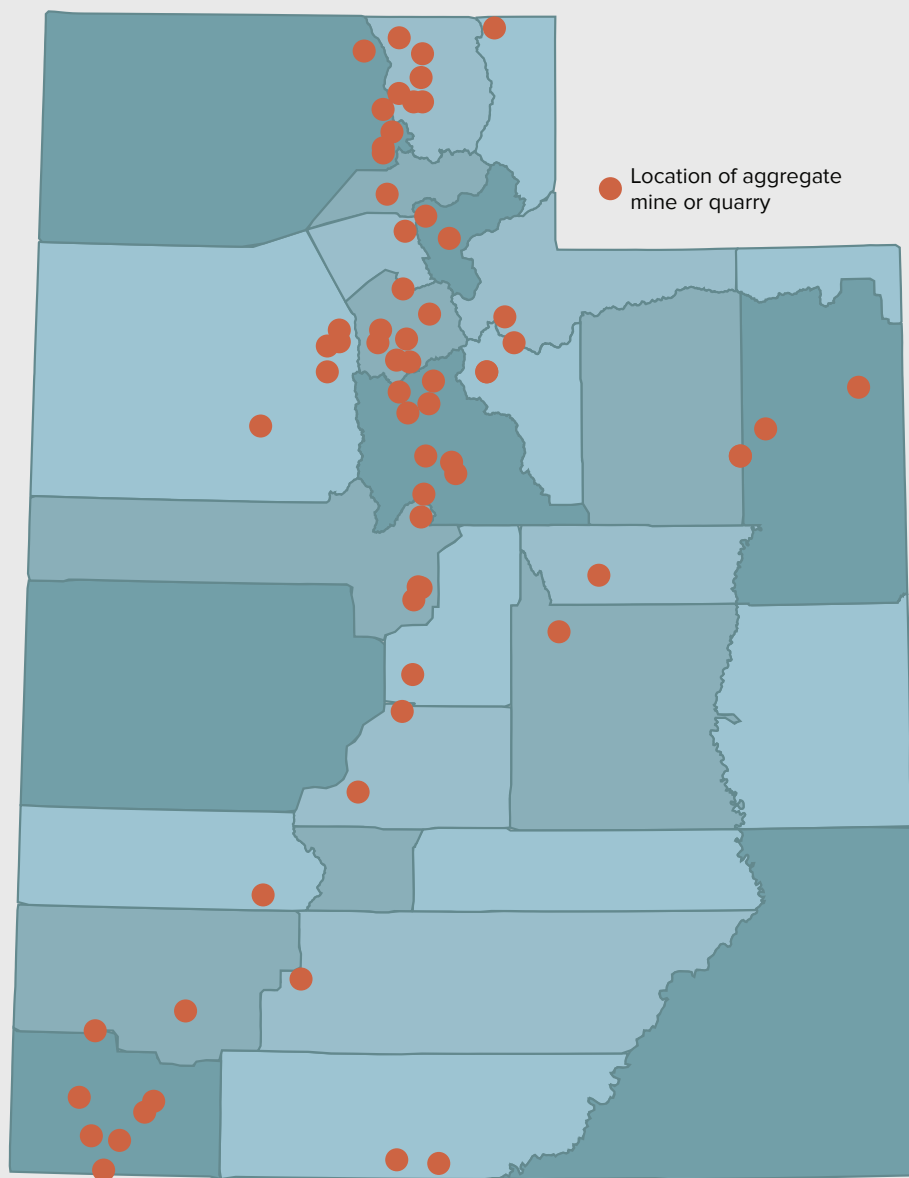
On a large scale, aggregates are plentiful. However, they are not uniformly distributed. The largest quantities of high-purity crushed stone are in the central and eastern U.S.⁷ Similarly, sand and gravel is plentiful, but geographic distribution, environmental regulations and quality requirements can make sand and gravel extraction less profitable.⁸ The Colorado Plateau, which encompasses much of eastern Utah, has been recognized as one of five areas in the continental U.S. where natural aggregate is in short supply.⁹ The western half of Utah is part of the Great Basin which features alluvial fans as a source of sand and gravel. However, in many cases these materials require significant processing before their use as aggregates due to their poor sorting. River and stream deposits are widespread, but vary widely in their quality.¹⁰ In areas where aggregates are more scarce, more cost efficient transport methods such as rail or backhauling, or

replacement materials such as substitutes and recycling, help address the shortage.

One of the largest challenges faced by aggregates producers is the cost of transporting aggregates to the market. Aggregates tend to be used in large quantities. As noted, there are 38,000 tons used for every mile of four-lane highway. While the cost of the material is low compared to many other minerals (the average cost per ton for aggregates in Utah was \$7.70 in 2017),¹¹ aggregate transport is expensive. In fact, the price of shipping each ton of sand and gravel doubles at 23 miles, and doubles for crushed stone at 45 miles.¹² It is because of the high cost of transportation that the aggregate industry tends to be local; approximately 1% of aggregates are imported and exported each year.

Aggregates operations are tied to local communities and span the state.

Figure 1: Quarry locations in Utah



Source: Clyde Cos., Kilgore Cos. and Staker Parson.

The overwhelming majority of aggregates used in Utah are produced in Utah. In fact, 90% of all aggregates are consumed within 50 miles of where they were extracted and processed.¹³ In other words, unlike many other industries where borders are fluid and companies can choose where to expand and contract, the aggregates industry is strongly tied to local communities. In Utah, there are aggregate quarries in at least 23 of 29 counties. (The only counties in Utah that are not impacted directly by the aggregate industry are Daggett, Garfield and Piute.) Many of these quarries have been in place for generations. For example, some of the largest and most commonly viewed quarries (such as the one off I-15 at the border between Utah and Salt Lake counties) have been in operation for more than 85 years.¹⁴

The United States Geological Survey classifies aggregates in two categories: 1) crushed stone and 2) sand and gravel.

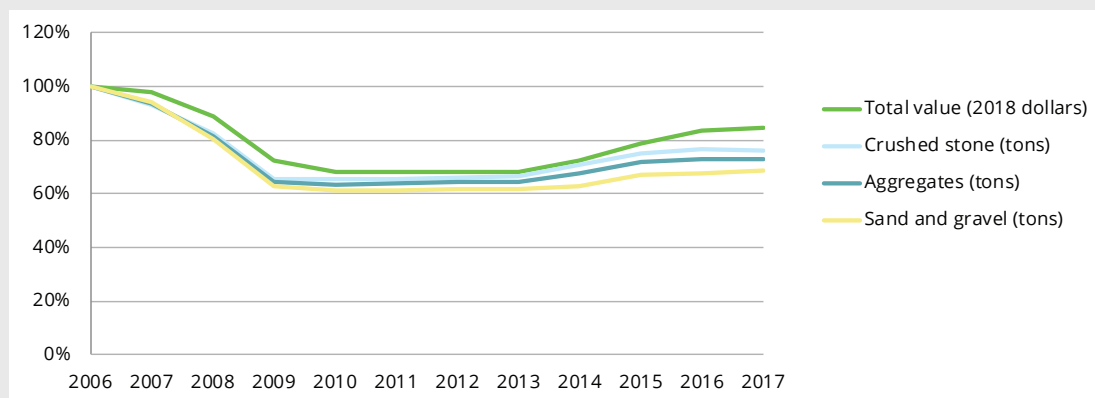
In 2017, the United States produced 1.33 billion tons of crushed stone, producing \$15 billion in economic value.¹⁵ Three-quarters of that was used as construction material, primarily for road construction maintenance (The majority of materials in asphalt, concrete and road base consist of aggregates).¹⁶ Another 11% was used for cement manufacturing.¹⁷ Utah produced over 10 million tons, worth \$78 million.¹⁸ Also in 2017, the United States produced 890 million tons of gravel and sand valued at 7.7 billion.¹⁹ Around 44% was used in concrete, 25% for road base, 13% for asphalt aggregate and 12% as construction fill.²⁰ Utah produced 31 million tons worth \$253 million.²¹ Nationally, 59% of the aggregate material produced by weight is crushed stone.²² However, in Utah only 21% of aggregate material produced by weight is crushed stone.²³

Aggregates Production over Time

Aggregate production in the United States peaked in 2006, and predictably fell during the 2008 recession. It was only in 2017 that total aggregate values in the nation topped the pre-recession peak in nominal dollars. However, in terms of real dollars and tons produced, the U.S. remains below pre-recession levels.

U.S. aggregate production value has surpassed pre-recession levels in nominal dollars, though not on an inflation-adjusted basis.

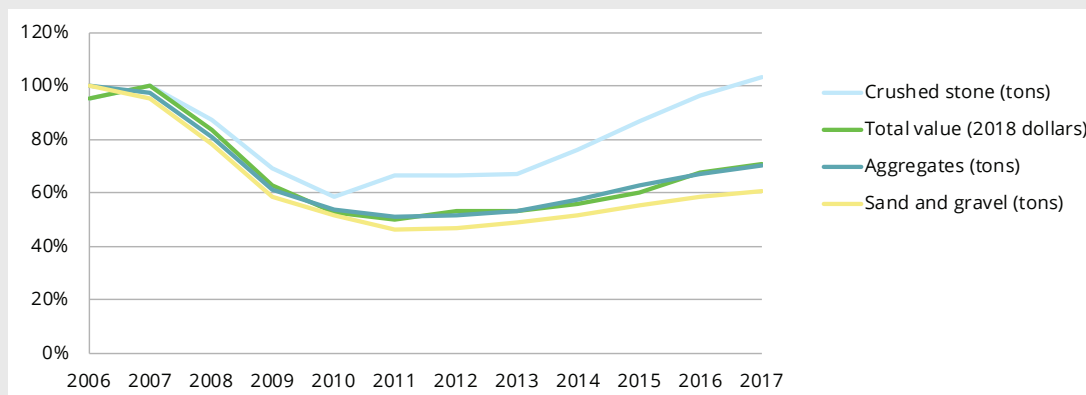
Figure 2: Value and Amount of Aggregate Production, U.S., as a share of pre-recession peak



Source: USGS.

The Mountain States' crushed stone tonnage has surpassed the pre-recession peak, but sand and gravel and dollar value still fall short on an inflation-adjusted basis.

Figure 3: Aggregate Production, Mountain States, as share of pre-recession peak



Source: USGS.

The Mountain West states (the states bordering Utah along with Montana) produce just under 10% of the nation's aggregates, although that amount fluctuates from year to year. As with the U.S., aggregate production in the Mountain West states peaked in 2006 but total aggregate production and value have not yet reached pre-recession peak. While the amount of crushed stone produced in Mountain West states surpassed the pre-recession peak, sand and gravel in 2017 remains less than two-thirds of its 2007 production level.

WHAT ARE IMPACT MULTIPLIERS?

Utah's economy is a diverse and robust system. One additional job in the economy can support others, with both ancillary effects and effects from consumer spending. For example, expansion in the aggregates industry would require heavy machinery, providing new jobs in that industry. Those new workers might also require additional support staff. New salespeople would need to be hired to find placement for the increased output. In addition, the newly employed workers would spend their income purchasing housing, necessities of life and engaging in leisure activities, providing additional jobs in those industries.

As a result, economic analyses often categorize employment impacts broadly into four categories: initial, direct, indirect and induced. The initial impact has to do with the specific job created. It represents one employed individual mining or processing aggregates. Direct impacts are those jobs created in the same industry that support individuals directly engaged in the mining and processing of aggregates. Such impacts might be new sales, managerial or support positions. Indirect impacts are those that benefit the industries that supply the core industry. Induced impacts are the impacts from employees spending their income and helping to support jobs throughout the community.

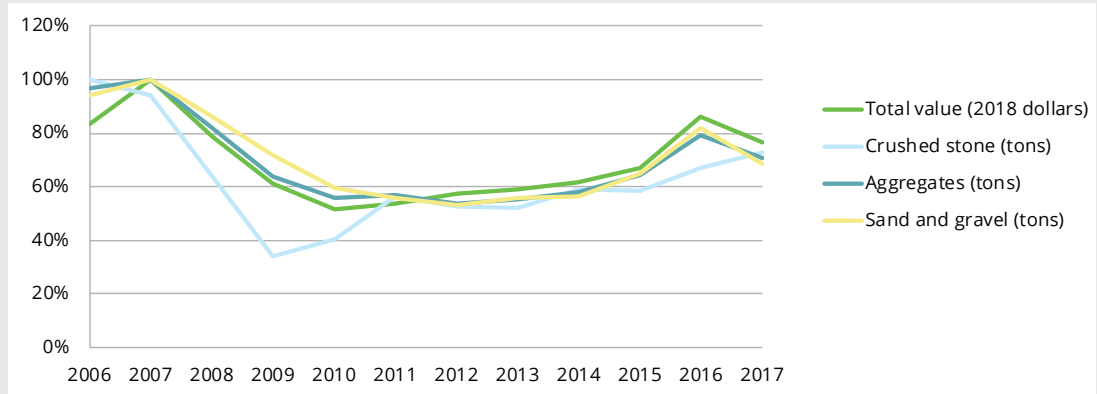
These impacts can be viewed in terms of their multipliers. An industry multiplier shows the impact from jobs and economic activity in terms of the direct, indirect and induced jobs and their resultant incomes and spending.

These multipliers generally tend to be greater when viewed across larger geographies. As geographies become more specific, they tend to be reduced because they isolate only the effects directly related to the smaller geography. This can exclude spillover effects from neighboring geographies. In most cases, local factors can have substantial impacts on multipliers, creating a wide range between what might seem like similar geographies.



When adjusted for inflation, the total value of Utah’s aggregate production remains below pre-recession levels.

Figure 4: Aggregate Production, Utah, as a share of pre-recession peak



Source: USGS.

Utah produces around 15% of the aggregates produced among the eight Mountain States. Across all measures, Utah remains below its peak pre-recession production levels, despite Utah’s booming economy.

ECONOMIC IMPACTS

Aggregates Industry Establishments and Jobs

For the purposes of this study, the aggregates industry has been defined by four codes within the North American Industry Classification System (NAICS), as shown in Figure 5. This system classifies establishments for the use of governments, economists and others who study the economy.

NAICS codes define establishments, but not job types. Governments, economists and others often use a different set of classifications to organize jobs known as the Standard Occupational Classification (SOC). Some of the most common jobs among employees

The aggregate industry is commonly defined by these four NAICS classifications.

Figure 5: North American Industry Classification System Codes for the Aggregate Industry

Code	Classification
212312	Crushed and Broken Limestone Mining and Quarrying
212313	Crushed and Broken Granite Mining and Quarrying
212319	Other Crushed and Broken Stone Mining and Quarrying
212321	Construction Sand and Gravel Mining

Nine of the top 10 occupations in the aggregates industry are paid above Utah's median hourly wage, \$17.14.

Figure 6: Common Standard Occupational Classification Job Titles, 2018

SOC	Description	% of Jobs*	Hourly Wage
00-0000	All Occupations	-	\$17.14
47-2073	Operating Engineers/ Other Construction Equipment Operators	11%	\$21.94
53-3032	Heavy and Tractor-Trailer Truck Drivers	10.3%	\$21.36
53-7032	Excavating and Loading Machine and Dragline Operators	8%	\$19.23
51-9021	Crushing, Grinding, Polishing Setters, Operators	4%	\$21.50
47-5041	Continuous Mining Machine Operators	3.6%	\$24.11*
47-5051	Rock Splitters, Quarry	3.3%	\$17.57
47-1011	First-Line Supervisors of Construction Trades and Extraction	3.2%	\$27.84
49-3042	Mobile Heavy Equipment Mechanics, Except Engines	2.9%	\$24.79
11-1021	General and Operations Managers	2.8%	\$33.23
43-9061	Office Clerks, General	2.8%	\$14.07

*State-level data unavailable. Supplemented with national data reported by the Phoenix Center for Advanced Legal & Economic Public Policy Studies.

Sources: Utah Department of Workforce Services, U.S. Bureau of Labor Statistics, Phoenix Center for Advancing Legal & Economic Public Policy Studies.

in establishments identified by the NAICS industries in Figure 5 are shown in Figure 6.

National Impact of the Aggregates Industry

The Phoenix Center for Advanced Legal and Economic Public Policy Studies found that, in 2016, gross receipts for the aggregates industry reached \$27.2 billion.²⁴ Of this amount, \$6.1 billion was reported to be redistributed as earnings (wages, salaries and proprietor income), with \$15.0 billion to the national economy's GDP and an estimated \$586 million in federal, state and local taxes.

The Phoenix Center also reported job creation multipliers for the nation. At the national level, each job in the aggregates industry supports an additional 4.87 jobs in the economy. That means the 61,000 quarry jobs nationally support between 275,000 and 495,000 jobs in total, with estimates ranging from \$78 billion to \$121 billion in economic activity.²⁵

Utah sees a significant economic impact from the aggregates industry.

Figure 7: Utah Aggregate Industry Jobs, Earnings, Sales and Impact

	Aggregate Industry	Multiplier	Impact on other industries	Total Impact
Jobs	1,620	2.10	1,790	3,410
Earnings	\$53,665,808	3.40	\$128,767,737	\$182,433,545
Value Added	\$166,149,922	2.05	\$175,219,935	\$341,369,857
Sales	\$331,000,000	2.03	\$339,549,637	\$670,549,637

Source: Utah Foundation calculations, IMPLAN.

State-Level Impact of the Aggregates Industry

Using employment numbers from the companies aided by data from the U.S. Census' County Data Patterns, sales data from USGS and the economic modeling program IMPLAN, Utah Foundation generated estimates for employment and sales industry impacts for the state and by county.

Utah Foundation estimates that there are approximately 748 aggregate jobs (mining and processing) in Utah. Those, in turn, generate an additional 872 support jobs within the aggregates industry from sales to management to human resources. Those 1,620 jobs in turn, supported another 1,790 across the state. (See Figure 7.)

Employees in the aggregates industry alone earned nearly \$54 million, and all employees supported by the aggregates industry earned over \$182 million in 2018. That translates into up to \$2.7 million and \$9.1 million respectively in revenue for Utah through state income taxes.

While the industry alone generated \$331 million in sales, it supported a total of \$671 million in sales across the state. While not all of the sales would be taxable, it could generate up to \$31 million in sales taxes for the state and another \$10 million for local governments.

The 1,620 jobs in the aggregates industry support another 1,094 jobs as an indirect impact. These include supporting industries such as oil and gas operations, commercial and industrial machinery and equipment rental and leasing, and marketing and miscellaneous professional scientific and technical services. Jobs in the aggregates sector also support jobs down the line in building, construction and engineering, and real estate. (See Figure 8.)

The income spent by the 1,620 employees also supports 696 jobs in sundry industries. While fewer induced jobs are created, they span more industries than the indirect jobs. Induced effects primarily benefit the areas where individuals spend their income. Housing often accounts for 30% of individuals' income. Other retail industries also feature prominently. (See Figure 9.)

County-Level Impact of the Aggregates Industry

Employment. Utah Foundation used reports from two of the three major aggregate companies in Utah, along with U.S. Census data to generate county-level employment numbers for quarry workers in the aggregate industry. Total industry workers were based off USGS reported amounts for the nation and apportioned

Aggregates support many jobs related to construction, building and engineering services as well as supporting industries.

Figure 8: Ten Sectors Most Impacted Indirectly by Aggregate Industry, by Jobs Supported

Sector	Impact
Maintenance and repair construction of nonresidential structures (includes office buildings, utility structures, airports and runways, and parking lots and structures)	107
Support activities for oil and gas operations	107
Architectural, engineering, and related services (includes geological, geophysical, civil and construction engineering services)	106
Wholesale trade (includes the wholesale trade of asphalt and concrete)	78
Management of companies and enterprises	54
Commercial and industrial machinery and equipment rental and leasing	39
Other financial investment activities	37
Real estate	33
Insurance agencies, brokerages, and related activities	32
Marketing research and all other miscellaneous professional, scientific, and technical services	23

Source: Utah Foundation calculations.

based on the share of quarry workers and total sales for Utah when compared to the rest of the nation. Support workers were then apportioned to counties based on the number of quarry jobs with a higher weight given to larger counties. While quarry workers are tightly linked to physical location, the same is not the case for support workers who tend to be seen more commonly in regional or state headquarters. The indirect and induced effects were generated from the IMPLAN model multipliers based on county sales numbers.

Unsurprisingly, the biggest county impact from Utah's aggregates industry is in Salt Lake and Utah counties, where a majority of Utahns live and where a majority of construction occurs. Utah's county employment multipliers ranged from 1.40 in Kane, Sanpete and Wayne counties to 2.09 in Washington County. The average multiplier among counties was 1.59.

Three counties (Daggett, Garfield, and Piute) had no apparent impact from the aggregates industry. Another 12 counties see a minimal impact with only a handful of aggregate jobs producing fewer than 20 jobs total. Five counties – Carbon, Emery, Iron, Morgan and Tooele – see a small to moderate impact with the aggregates industry supporting 13 to 21 jobs directly in each county and 32 to 54 jobs in total. Another five counties – Box Elder, Cache, Duchesne, Sevier and Summit – see moderate impacts with 21 to 32 quarry jobs in each county supporting 58 to 98 jobs in total. Washington, Weber and Utah counties have a large impact,

Income from aggregates employees support a variety of jobs in other industries.

Figure 9: Ten Sectors Most Impacted by Spending among Aggregate Industry Employees, by Jobs Supported

Sector	Impact
Real estate	46
Limited-service restaurants	39
Hospitals	31
Full-service restaurants	28
Retail - General merchandise stores	22
Offices of physicians	20
Retail - Food and beverage stores	19
Wholesale trade	18
Other financial investment activities	17
All other food and drinking places	15

Source: Utah Foundation calculations.

seeing 36 to 84 jobs tied directly to the quarry jobs supplying around 136 to 300 jobs in each of those counties. Salt Lake County sees the largest impact from the aggregates industry where 322 quarry jobs support nearly 1,700 jobs total. However, it should be noted that much of the aggregate extraction in Salt Lake County occurs on its borders. The analytical model placed the economic benefits based on location of employment. To the degree that workers commute from other counties, and supply chains cross county borders, some of the economic benefit seen by Salt Lake County will actually benefit its neighboring counties.

Counties show a wide variation in aggregates industry impact, with Salt Lake accounting for half of the total jobs.

Figure 10: Utah Counties' Aggregate Industry Jobs, Multiplier and Impact, 2018

County	Initial (Quarry) Jobs	Direct Jobs	Indirect Jobs	Induced Jobs	Industry Multiplier	Total Jobs
Beaver	5	2	2	1	1.41	10
Box Elder	25	18	14	6	1.46	63
Cache	21	14	18	5	1.68	59
Carbon	17	11	11	4	1.54	43
Davis	7	3	5	2	1.68	17
Duchesne	24	17	17	3	1.50	61
Emery	21	14	13	5	1.51	53
Grand	1	0	0	0	1.48	2
Iron	17	11	13	6	1.66	46
Juab	5	2	2	2	1.57	11
Kane	2	1	1	0	1.40	4
Millard	5	2	3	1	1.56	11
Morgan	13	8	12	1	1.64	34
Rich	2	1	1	1	1.59	4
Salt Lake	322	537	515	325	1.98	1,699
San Juan	1	0	0	0	1.48	2
Sanpete	2	1	1	0	1.40	4
Sevier	32	25	22	18	1.70	97
Summit	28	21	25	9	1.69	83
Tooele	15	9	9	1	1.42	34
Uintah	3	1	2	1	1.57	6
Utah	84	90	82	42	1.71	297
Wasatch	1	0	1	0	1.64	2
Washington	36	29	42	29	2.09	136
Wayne	1	0	0	0	1.40	2
Weber	58	55	48	14	1.54	174
State of Utah	748	872	1,094	696	2.10	3,410

Source: Utah Foundation calculations using IMPLAN, U.S. Census Bureau and USGS data, and Utah Foundation surveys of local companies.
Numbers may not add due to rounding and interjurisdictional effects.

Sales. The USGS reports that the aggregates industry generated \$331 million across Utah in sales. Utah Foundation apportioned this amount to counties based on the ratio of quarry workers, and IMPLAN generated estimates of county multipliers.

Across the counties where the aggregates industry is present, multipliers range between 1.18 in Rich and 2.23 in Salt Lake, with an average of 1.44 based on local economies. Washington, Weber, and Utah see a large impact of \$20 to \$60 million in sales. Salt Lake sees the largest impact with the aggregates industry driving

Counties show a wide variation in aggregates industry sales impact, with Salt Lake at the top.

Figure 11: Utah Counties' Aggregate Industry Jobs, Multiplier and Impact, 2018

County	Direct Effect (Sales)	Indirect Effect	Induced Effect	Industry Sales Multiplier	Total Effect
Beaver	\$2,243,956	\$1,064,595	\$203,678	1.57	\$3,512,228
Box Elder	11,219,779	1,915,431	645,437	1.23	13,780,647
Cache	9,424,615	4,028,247	874,740	1.52	14,327,602
Carbon	7,629,450	2,840,771	651,204	1.46	11,121,424
Davis	3,141,539	1,177,657	348,196	1.49	4,667,392
Duchesne	10,770,989	4,797,907	572,365	1.50	16,141,260
Emery	9,424,615	2,678,058	619,710	1.35	12,722,386
Grand	448,791	148,194	26,884	1.39	623,869
Iron	7,629,450	2,114,504	640,107	1.36	10,384,060
Juab	2,243,956	305,601	164,651	1.21	2,714,209
Kane	897,583	316,630	30,490	1.39	1,244,703
Millard	2,243,956	875,416	254,012	1.50	3,373,383
Morgan	5,834,286	3,188,116	261,153	1.59	9,283,555
Rich	897,583	104,786	57,104	1.18	1,059,472
Salt Lake	144,510,761	122,583,606	54,962,534	2.23	322,056,902
San Juan	448,791	102,129	34,159	1.30	585,079
Sanpete	897,582	205,182	48,556	1.28	1,151,319
Sevier	14,361,318	2,894,674	1,363,838	1.30	18,619,830
Summit	12,566,153	3,827,653	1,014,476	1.39	17,408,281
Tooele	6,731,868	1,842,546	279,432	1.32	8,853,846
Uintah	1,346,373	589,942	115,765	1.52	2,052,080
Utah	37,698,459	14,218,320	5,586,820	1.53	57,503,599
Wasatch	448,791	204,275	22,553	1.51	675,619
Washington	16,156,482	4,548,511	2,554,550	1.44	23,259,544
Wayne	448,791	145,807	7,905	1.34	602,503
Weber	26,029,888	10,615,442	2,217,223	1.49	38,862,554
State	335,695,805	238,683,690	105,683,044	2.03	680,062,539

Source: Utah Foundation calculations using USGS data and IMPLAN. Numbers may not add due to rounding and interjurisdictional effects.



LONG-TERM IMPACTS: DEPLETED QUARRIES

Reducing the impacts of the aggregates industries to its value based on the industry's employment and sales value does not capture the entire long-term impacts of quarries. Even after quarries have closed, they can continue to provide benefits to local communities. Several high provide examples include depleted quarries near Tacoma, Wash., and Duluth, Minn., both of which have been adapted into golf courses. Depleted quarries in Connecticut and San Antonio, Texas, have become amusement parks. A quarry in Wake Forest, N.C., was turned into a lake that offers recreational and training scuba diving. A depleted quarry in the center of Sand Diego, Calif., became one of the largest examples of urban infill, creating 4,780 residences, nearly a million square feet in office and retail space all organized around a network of parks and open space linked with bike paths and accessible trails.

a total of \$322 million in sales in county. Three counties see no direct impact, while seven others see minimal impact with the aggregate industry driving a total of \$2 million in sales. Seven others see a small impact with the aggregate industry supporting a total of \$2 million to \$10 million in total sales. Eight counties see a moderate impact with aggregates driving \$10 million to \$20 million total in sales.

CONCLUSION

In Utah, the aggregates industry provides a large number of well-paid jobs and is important to the modern economy. Some 1,620 jobs in the aggregate industry create a total of 3,410 jobs throughout the state, while the \$331 million in sales drives a total of \$680 million throughout the state. Only three of Utah's 29 counties are not directly impacted by the aggregates industry. Washington, Weber and Utah counties see particularly large impacts, and Salt Lake County stands far above other counties in terms of the number of jobs and sales created and supported by the aggregates industry. It is easy to conclude that Utah's diversified economy benefits not only from having a strong aggregates industry which provides local sources of construction and building materials, but also benefits as high-wage jobs in the industry have a ripple effect through the rest of the economy.

Moreover, merely focusing on the economic impact of jobs and sales of the aggregates industry in Utah grossly understates the full benefit of the aggregates industry to the modern economy and society. Because aggregates are vital in building construction, road construction and repair, in many ways, aggregates form the foundation of a modern economy. Local sources of aggregates minimize construction costs and reduce truck traffic on roads. This in turn helps keep transportation costs low and allow for commerce to continue unimpeded. Similarly, aggregates are required for the construction of buildings. Reasonably priced and nearby sources of aggregates improve housing affordability and economies in the construction of commercial buildings where business is conducted. More broadly speaking, it is not an exaggeration to state that the aggregates industry provides the raw materials for wide ranging purposes that make economic growth and modern civilization itself possible.

APPENDIX

Employment Estimates

Quarry Workers. The backbone of the analysis relies on the industry employment of quarry workers. Utah Foundation derived state employment data from the U.S. Census' County Business Patterns and U.S. Geological Survey Commodity Survey (USGS) data. County employment data was calculated using census data supplemented with job counts from Staker Parson Materials and Construction and Clyde Companies to provide a higher level of accuracy. The following industry codes were used to gather data on the aggregates industry.

212312	Crushed and Broken Limestone Mining and Quarrying
212313	Crushed and Broken Granite Mining and Quarrying
212319	Other Crushed and Broken Stone Mining and Quarrying
212321	Construction Sand and Gravel Mining

For areas with few establishments, the Census Bureau does not publish employment data. They do however classify establishments by a range of employees at the establishment. Utah Foundation used an ordinary least squares regression against all industries beginning with the code 2123 in Utah to generate coefficients. The coefficients for the two smallest groupings, 1-4 and 5-9, were slightly rounded up as the coefficient produced by the regression fell below the lower bound of the categorization. When Census numbers were available, they were used. When not available, employment estimates were generated using the coefficients mentioned above. The estimates were checked against employment ranges published by the Census. When estimates fell below or above Census employment ranges, Utah Foundation adopted the closest boundary of the range as its estimate. Census numbers were compared from reported employees from two of the three largest aggregates employers in the state. In counties where reported employees were greater, the larger number was used. In counties where Census estimates were higher, the five-year average was averaged with the number of reported employees. This produced a series of county estimates that aligned with higher-level state data.

Total Industry Employment. The USGS annually reports industry employment numbers for the crushed stone and construction sand and gravel industries. Utah Foundation assigned a portion of these national numbers based on its share of quarry workers and total sales as a portion of the national total. Quarry workers were then subtracted from industry employment numbers to generate a total for support workers. These support workers were assigned to counties based on the counties' share of aggregates workers. However, while aggregates workers are tied to the physical location of the quarry, the same is not true for support workers. As a result, Utah Foundation allocated support workers based on the number of quarry workers raised to the 1.33 power. This produced heavier weights for Salt Lake, Utah, Weber and Washington counties, and left the remaining counties with a reasonable apportionment of quarry workers.

Indirect and Induced Employment. Indirect and induced workers were generated based on multiples reported by IMPLAN. IMPLAN had limited data for certain counties. For Wasatch, Summit, Sevier and Juab, IMPLAN had no crushed rock data. As a result, sand and gravel data were used. In Grand, Emery and Carbon, neither crushed rock nor sand and gravel data were available. Utah Foundation

generated multipliers by averaging the surrounding counties.

Sales. State sales were apportioned to counties based on quarry jobs. Indirect and induced sales numbers were generated from the IMPLAN model.

ENDNOTES

- 1 U.S. Department of the Interior, U.S. Geological Survey, “Mineral Commodity Summaries 2018”, 2018, <https://minerals.usgs.gov/minerals/pubs/mcs/2018/mcs2018.pdf>; Phoenix Center for Advanced Legal & Economic Public Policy Studies, “The Economic Impact of the Natural Aggregates Industry: A National State and County Analysis,” 2017, <http://www.phoenix-center.org/scorecards/AggregatesIndustry2017ScorecardFinal.pdf>.
- 2 National Stone, Sand & Gravel Association, “50 Fascinating Facts about Stone, Sand & Gravel,” 1993, <https://www.speakcdn.com/assets/1312/50facts.pdf>
- 3 National Stone, Sand & Gravel Association, “Rocks Build America” (undated) <https://www.nssga.org/rocks-build-america/>.
- 4 U.S. Department of the Interior, U.S. Geological Survey, “Mineral Commodity Summaries 2018,” 2018, <https://minerals.usgs.gov/minerals/pubs/mcs/2018/mcs2018.pdf>.
- 5 Ibid.
- 6 Ibid.
- 7 Ibid.
- 8 Ibid.
- 9 Langer, William H., “Aggregate Resource Availability in the Conterminous United States, Including Suggestions for Addressing Shortages, Quality, and Environmental Concerns,” Open-File Report 2011–1119, *United States Geological Survey, 2011*, https://pubs.usgs.gov/of/2011/1119/pdf/OF11-1119_report_508.pdf.
- 10 Langer, William H., “Aggregate Resource Availability in the Conterminous United States, Including Suggestions for Addressing Shortages, Quality, and Environmental Concerns,” Open-File Report 2011–1119, *United States Geological Survey, 2011*, https://pubs.usgs.gov/of/2011/1119/pdf/OF11-1119_report_508.pdf.
- 11 U.S. Geological Survey, “Mineral Industry Surveys: Crushed Stone and Sand and Gravel in the First Quarter 2018” 2018, https://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mis-2018q1-stonc.pdf.
- 12 G.R. Robinson Jr. and W.M. Brown, Sociocultural Dimensions of Supply and Demand for Natural Aggregate – Examples from the Mid-Atlantic Region, U.S. Geological Survey Open-File Reports 02-350 (2002).
- 13 Phoenix Center for Advanced Legal & Economic Public Policy Studies, “The Economic Impact of the Natural Aggregates Industry: A National State and County Analysis,” 2017, <http://www.phoenix-center.org/scorecards/AggregatesIndustry2017ScorecardFinal.pdf>.
- 14 Geneva Rock Products, “Notice of Intention to Commence Large Mining Operations, Point of the Mountain Quarry Operation M-035-026,” 2009, www.scribd.com/document/156212451/Geneva-Rock-Mining-Permit.
- 15 U.S. Department of the Interior, U.S. Geological Survey, “Mineral Commodity Summaries 2018”, 2018, <https://minerals.usgs.gov/minerals/pubs/mcs/2018/mcs2018.pdf>.
- 16 Ibid.
- 17 Ibid.
- 18 U.S. Geological Survey, “Mineral Industry Surveys: Crushed Stone and Sand and Gravel in the First Quarter 2018” 2018, https://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mis-2018q1-stonc.pdf.

19 U.S. Department of the Interior, U.S. Geological Survey, “Mineral Commodity Summaries 2018”, 2018, <https://minerals.usgs.gov/minerals/pubs/mcs/2018/mcs2018.pdf>.

20 Ibid.

21 U.S. Geological Survey, “Mineral Industry Surveys: Crushed Stone and Sand and Gravel in the First Quarter 2018” 2018, https://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mis-2018q1-stonc.pdf.

22 Data gathered from years of Mineral Industry Surveys reports from the U.S. Geological Survey. An example can be found at: U.S. Geological Survey, “Mineral Industry Surveys: Crushed Stone and Sand and Gravel in the First Quarter 2018” 2018, https://minerals.usgs.gov/minerals/pubs/commodity/stone_crushed/mis-2018q1-stonc.pdf.

23 Ibid.

24 Phoenix Center for Advanced Legal & Economic Public Policy Studies, “The Economic Impact of the Natural Aggregates Industry: A National State and County Analysis,” 2017, <http://www.phoenix-center.org/scorecards/AggregatesIndustry2017ScorecardFinal.pdf>.

25 For the purposes of this report, quarry jobs generally refer to jobs relating to the extraction and immediate processing of sand, gravel and crushed stone.



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