

# 2018

# PROPPANT MARKET REPORT

## CONFIDENTIAL

Published March 4, 2019

Example Report

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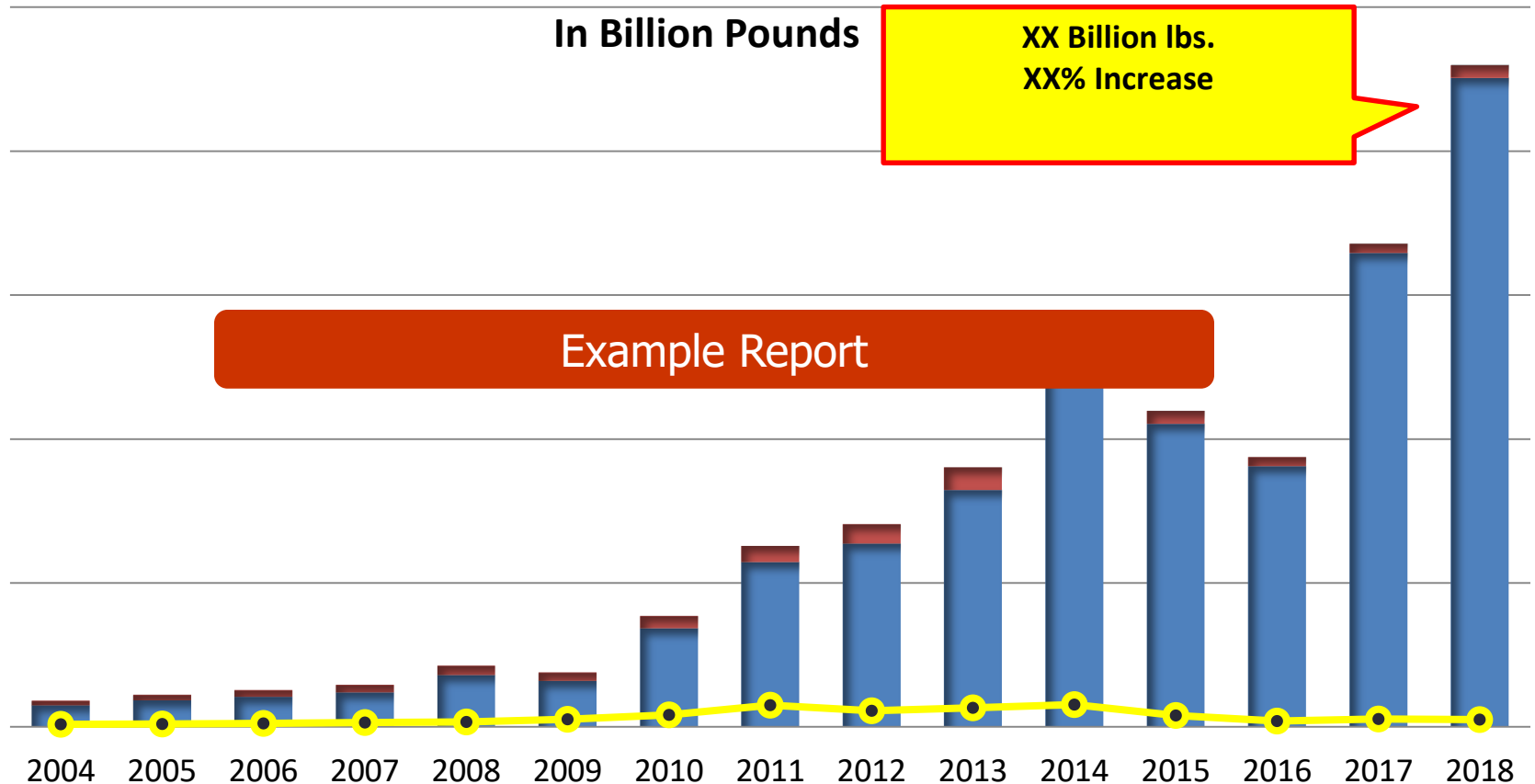
# Methodology

The **2018 Proppant Market Report** is a review of the 2018 proppant industry in relation to prior years. Market intelligence has been gathered from a variety of industry resources which include historical PropTester, Inc. and KELRIK, LLC databases, key pressure pumping and operator personnel, logistics providers, proppant suppliers and other public and private resources.

Primary information is received directly from proppant manufacturers. Specifically, we solicit proppant produced and supplied to the industry by individual proppant manufacturers each calendar year. Although this data is used to compile total proppant supply estimates, specific proppant supplier's sales are not disclosed. In cases where individual North American data by or **Example Report** disclosures, regulatory filings, acquisitions, divestitures, import data, and select transportation and pumping pressure company metrics. Due to the granular focus on manufacturers, total volumes represented may include inventories that have yet to be pumped downhole, but also exclude excess inventories from prior year.

Where feasible, we include an estimated annual proppant capacity for suppliers. A majority of these figures are voluntarily disclosed by the supplier. Unless noted otherwise, proppant capacities are annualized commencing first quarter of release date (1Q2019). Capacities can and do vary year to year, and this fact must be taken into consideration when reviewing this information. Operating conditions, mid-year capacity expansions or plant closures, market diversification or substitution, logistical constraints and product demand mix impact functional capacity. This is particularly the case with natural sand producers, where product mix and deposit yield impact gradation availability and production efficiencies.

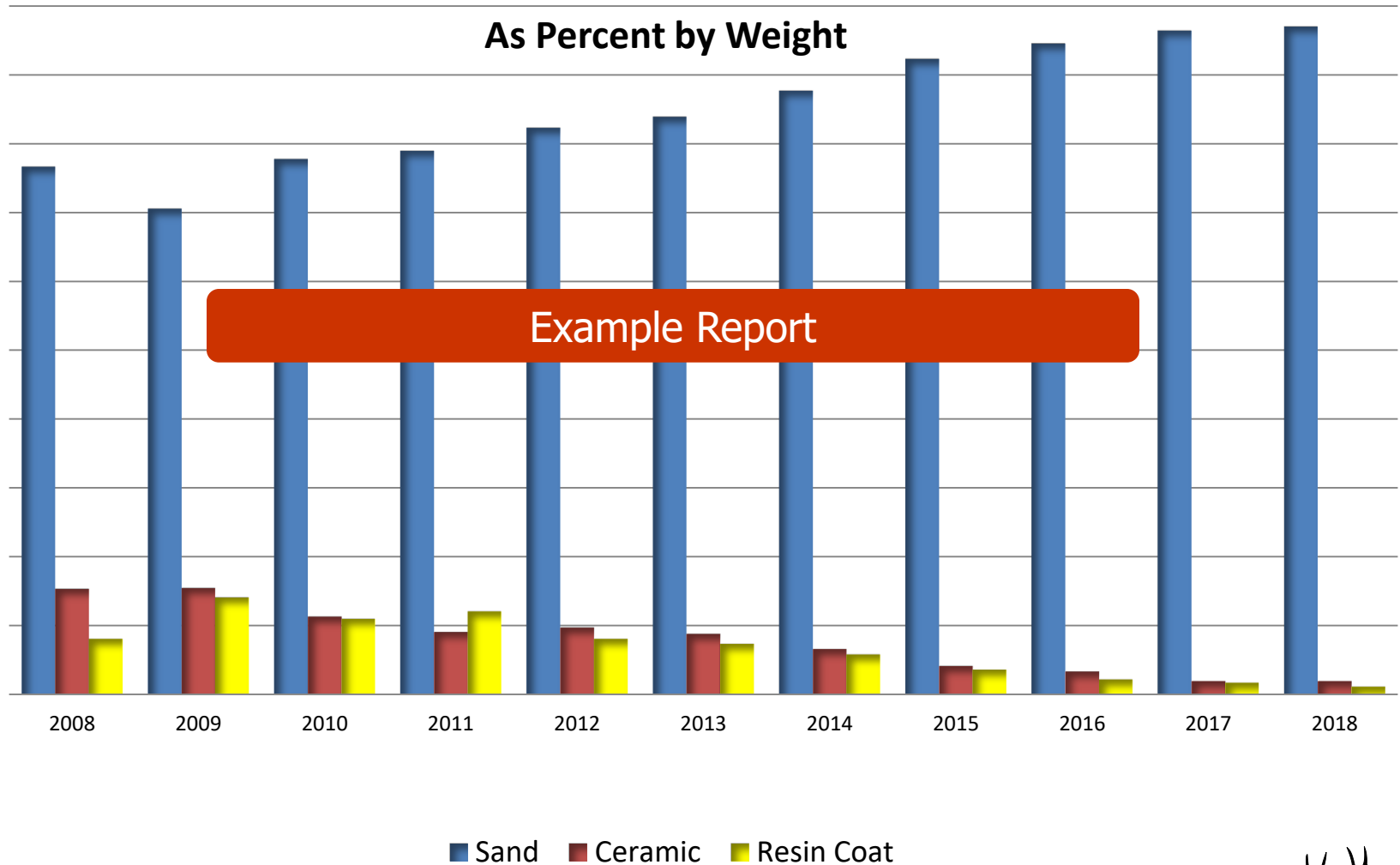
# Proppant Consumption by Year











■ Sand ■ Ceramic ● Resin Coat



# Proppant Consumption By Type (%)



# Key Factors Impacting Proppant Demand

Key Factors	Trend	2019 Outlook
<b>Energy Prices/Energy Demand</b>		Industry responds well to plus \$50 oil and \$3 gas. WTI averaged \$64.93/bbl in 2018 (vs \$50.88/bbl in 2017). US oil production surged as a result. Mid year constraints on Permian takeaway capacity and a slide in oil prices during 4Q18 and into early 2019, however, resulted in a softening proppant market 2H18. Natural gas prices remain relatively flat, and liquid prices will drive proppant demand in 2019. Although takeaway capacity is being addressed, 2019 sentiment is mixed (See Appendix: Oil and Gas Prices).
<b>Active Rig Count/Rig Type</b>		The Baker Hughes U.S. Rotary Rig Count improved significantly in 2018. 2018 rig averages were 840 oil (+20%) and 190 gas (+11%). We exited 2018 at a healthy 880 oil and 198 gas rigs. Canadian activity did not fare as well. Although initial rig count is positive, 2019 is expected to be relatively flat to prior year. (See Appendix – Rig Metrics).
<b>Wells Drilled/Permitted</b>		Again, plus \$50 oil and \$3.00 natural gas is key, yet not all unconventional areas are profitable at this level. The reduction in proppant prices helps industry as a whole. Activity will continue to be focused on liquid basins in 2019, and not just Permian. DUCs also add to pent up proppant demand.
<b>Well Trajectory (Horizontal vs. Vertical)</b>		
<b>Lateral Lengths</b>		The amount of source rock that can be exposed with long laterals (10,000 - 20,000 ft) is tremendous. Longer laterals equal more frac stages. Challenges in terms of drilling these wells and transporting and placing proppant into the rock, however, remain. Research continues on new fluids and proppants/micro-proppants/ultra lightweight proppants to address some of these challenges. Without that, we are approaching practical limits.
<b>Hydrocarbon Type (gas vs. oil, wet vs. dry)</b>		Recent practices to utilize large volumes of finer mesh sands in both liquid and gas wells created mine-yield imbalances, periodic gradation shortages and reduced premium proppant demand. The sand industry met the challenge we addressed last year for improved fine sand supply in the Permian. A high level of completion activity in a few primary geographic basins can still strain logistical resources. Standardized (factory mode) the new norm.
<b>Formation Type</b>		Advancements in understanding tight oil and shale gas continue, but it is still a learning curve. Proppant fracturing continues to be the key to unconventional resource development, but the wells still have high decline rates requiring new drilling and completion activity in order to maintain production. There is much left to learn.
<b>Completion Design/Changes (e.g., economic well evaluation)</b>		Proppant is a significant factor in overall well costs. Operators downgraded proppant quality to minimize costs and preserve capital. Lower quality proppants, regional proppants and/or finer mesh proppants were utilized at the expense of higher cost, premium proppants. This trend continues. Well productivity is still the primary goal, but cash flow rules. High intensity proppant completions buoy proppant demand, but the entire proppant industry has become increasingly commoditized. Whereas overall proppant demand is up, there is significant concern as to viability of many traditional proppant types (ceramic, resin and traditional Tier 1 and Tier 2 sands) in the USA. There are still wells being “engineered”, but the North American model is increasingly a low cost factory model.

# Hickory Sand – XX MM Tons

Designation/ Plants	Primary Source(s)	State	12/20	16/30	20/40	30/50	40/70	100M	In Basin	Logistics
Hickory/Brown (HICK)	Hickory	TX	✓	✓	✓	✓	✓	✓	Regional Various	Truck Select Rail

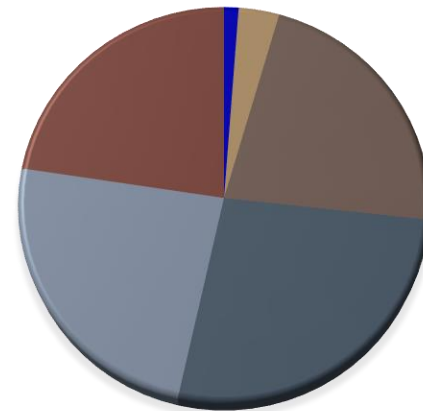
Hickory Sand (Tier 2 coarse fractions) is widely referred to as Brady or Brown. The Hickory sandstone is Cambrian and part of the Riley formation located in McCulloch and Mason counties in Central Texas. It is not as mineralogically or texturally mature as Northern White Sands, and contains higher levels of polycrystalline, semi-composite grains. The resource is renowned for having high percentages of coarse-grained, well rounded sand grains from 4/8 thru 20/40 mesh. First exploited for glass sand in the 1940s, references addressing the use of “Heart-of-Texas” sands for free sand can be traced to 1958. 20/40 and coarser free grades became increasingly important in the 1970s and 1980s due to the demand for 20/40, 30/50, 40/70, 40/70 and 100 M).

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Notables	Plants (7)	Frac Capacity (Tons)
Company A	2 <b>Idling 1Q19</b>	1,200,000
Company B	1	1,200,000
Company C	1	1,200,000
Company D	1	625,000
Company E	<b>2 Idled</b>	<b>Was 2,000,000</b>

Note: Despite announced closures, all plants were very active in 2018.

PERCENT BY MESH 1Q19



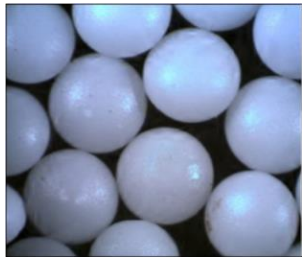
# Notable Sand Additions

Company	Area	1H18	2H18	1H19	2H19	1Q20	Total	40/70	100M	Total
Aggregates Industries	San Antonio	0.650					0.650		0.650	0.650
Black Mt. "Dimmit"	Carrizo Spgs		1.000				1.000		1.000	1.000
Black Mt. "Bigfoot"	Poteet			2.000			2.000		2.000	2.000
Emerge Energy	San Antonio	0.600	3.100		0.300		4.000	1.480	2.220	3.700
Emerge Energy	Kosse	0.600					0.600		0.600	0.600
J. M. Sand	Van Army		1.000				1.000		1.000	1.000
Penley Bros. "Eden"	Seguin			1.500			1.500			0.000
Penley Bros. "Eden"	San Antonio			1.000			1.000			0.000
Penley Bros. "Eden"	San Antonio								2.250	3.000
Penley Bros. "Eden"	Horseshoe			2.000			2.000			0.000
Ultra Fine Silica	Hallettsville				4.000		4.000			0.000
United/Atlas Mining	Three Rivers				3.000		3.000			0.000
US Silica	Kosse	0.500					0.500		0.500	0.500
Wildhorse (CHN)	Burleson Cty	2.000	2.000				4.000	0.20	1.800	2.000
X CO-TBA	South TX			2.400			2.400			0.000
Y CO-TBA	South TX						0.000			0
Z CO-TBA	South TX						0.000			0
<b>Total</b>	<b>South Texas</b>	<b>7.350</b>	<b>7.100</b>	<b>11.900</b>	<b>7.300</b>	<b>0.000</b>	<b>33.650</b>	<b>2.430</b>	<b>12.020</b>	<b>14.450</b>
<b>Comulative</b>	<b>Million Tons</b>		<b>14.450</b>	<b>26.350</b>	<b>33.650</b>	<b>33.650</b>		<b>40/70</b>	<b>100M</b>	<b>1Q19</b>

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# Basic Ceramic/Synthetic Proppant Types

## Ultra-High Density



- $\sim 2.30 \text{ g/cm}^3$
- $> 145 \text{ lb/ft}^3$

## High Density



- $\sim 2.00 \text{ g/cm}^3$
- $> 127 \text{ lb/ft}^3$

## Intermediate



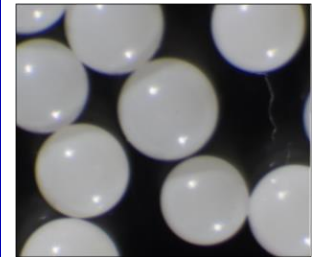
- $\sim 1.80 \text{ g/cm}^3$
- $\sim 117 \text{ lb/ft}^3$

## Lightweight



- $\sim 1.60 \text{ g/cm}^3$
- $\sim 100 \text{ lb/ft}^3$

## Ultra Lightweight



- $\sim 1.20 \text{ g/cm}^3$
- $< 80 \text{ lb/ft}^3$





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# Ceramic/Specialty Proppant Properties

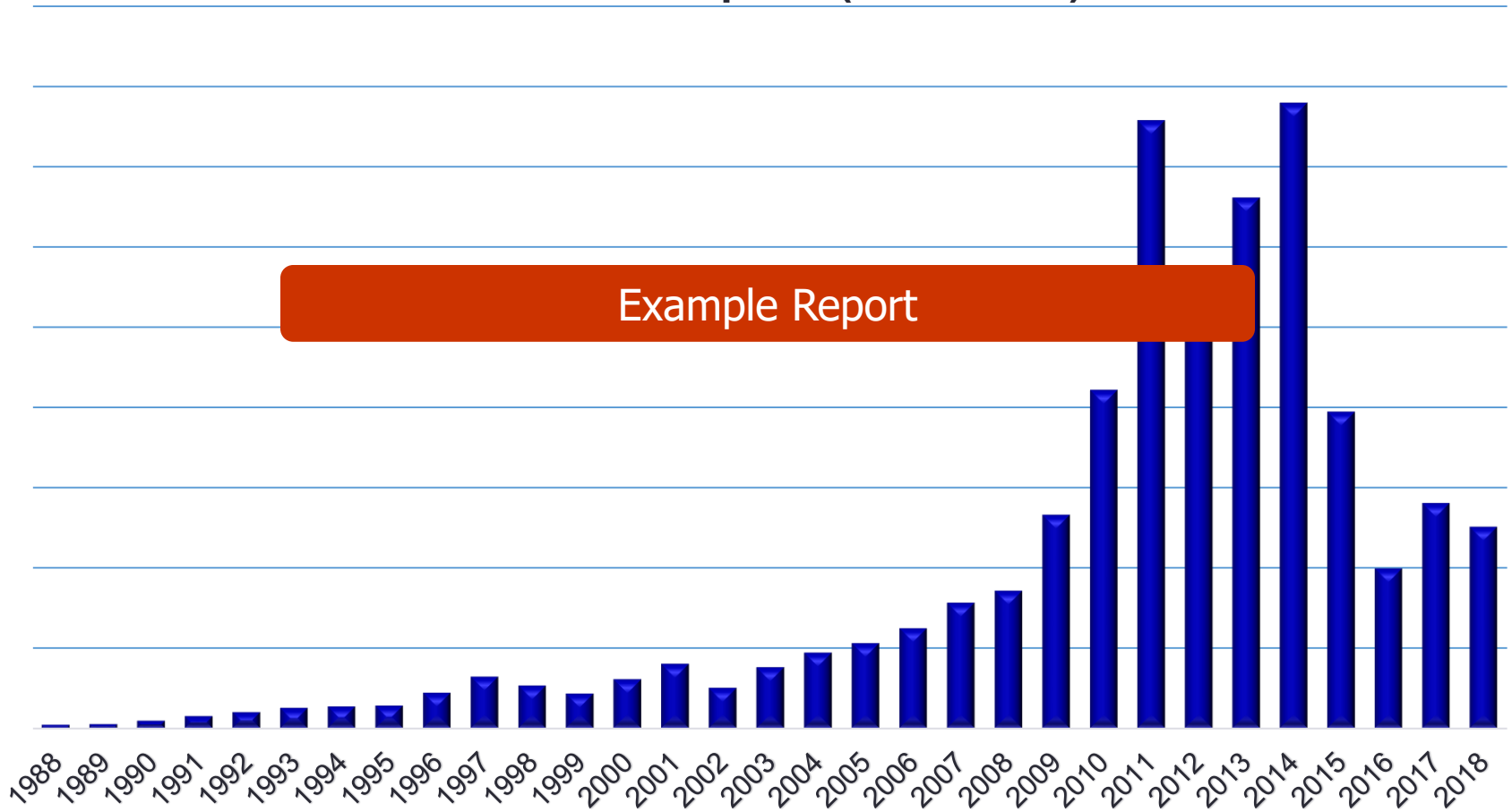
Type/ Properties	Ultra-high Density UHD	High Density HD or HSP*	Intermediate Density MD or ISP	Lightweight Density LWP	Ultra-light Density ULWP
Density	~ 2.30 g/cc	~2.00 g/cc	~1.80 g/cc	~1.60 g/cc	< 1.20 g/cc
Bulk Density*	>145 lb/ft <sup>3</sup>	>127 lb/ft <sup>3</sup>	~117 lb/ft <sup>3</sup>	~100 lb/ft <sup>3</sup>	< 80 lb/ft <sup>3</sup>
Solubility	< 2%	< 2%	< 2%	< 2%	Variable
Primary Feed	Bauxite	Bauxite	Bauxite	Kaolin Clay	Variable
Examples	Titan™ SinterMax®	UltraProp® SinterBall® SinterBlast® BorPropSSP Kryptosphere® HD	InterProp® VersaProp® SinterLite® SinterProp® Kryptosphere® LD	CarboLite® EconoProp® VersaLite® ShaleProp™ ForesMgLight® ExtraLite® ProLite™	FracBlack® LiteProp™ CARBOAIR® OmniProp®  (Select ULWPs are near neutral density)

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Company (Western Hemisphere)	Plant Locations	Access	Density Type	Estimated Realistic Proppant Capacity and Noteworthy Events
<b>Carbo® Ceramics, Inc.</b> <a href="http://www.carboceramics.com">www.carboceramics.com</a> 	Eufaula, AL Toombsboro, GA McIntyre, GA Millen, GA* (sold to USS 1Q19)	Shortline NS NS NS Truck	UHD HD MD LWP ULWP Microprop	<b>Capacity: 1.520 billion lbs (760,000 tons)</b> CARBO® (NYSE: CRR) is historically the largest supplier of ceramic proppants. Having previously closed Louyang, China and sold Kopeysk, Russia, the company is increasingly geared toward specialty oilfield proppants including the ultra high conductive Kryptosphere™ line, ultra low-density CarboAir™ and traceable proppant CARBONRT. Eufaula is currently the primary proppant facility although Toombsboro and McIntyre can be used as needed. The McIntyre facility is currently geared toward non oilfield applications (e.g., PicOnyx JV). The idled Millen facility was sold to US Silica in January 2019 for \$23 Million.
<b>Mineracao Curimbaba</b> <a href="http://www.grupocurimbaba.com.br">www.grupocurimbaba.com.br</a> <b>Sintex Minerals &amp; Service, Inc.</b> <a href="http://www.sintexminerals.com">www.sintexminerals.com</a> 	Pocos de Caldas, Brazil	Truck	HD MD LWP	<b>Capacity: 0.790 billion lbs (395,000 tons)</b> Sintex Minerals is a part of Grupo Curimbaba, a large Brazilian bauxite mining and processing company. The company produces various densities and shapes of sintered bauxite under the SinterBall® brand in Pocos de Caldas in southern Brazil. The company is not as dependent on the North American market as other US-based
<div style="background-color: #e67e22; color: white; padding: 10px; border-radius: 10px; display: inline-block;"> <h2 style="margin: 0;">Example Report</h2> </div>				
<b>St. Gobain Proppants</b> <a href="http://www.proppants.saint-gobain.com">www.proppants.saint-gobain.com</a> 	Little Rock, AR Guanghan, China	UPRR/Barge Truck	UHD HD MD LWP	<b>Capacity: 0.460 billion lbs (230,000 tons)</b> St. Gobain Proppants (formerly Norton Proppants) is the first company to introduce man-made (ceramic) proppants to the industry, dating back to 1973. The company closed its original Ft. Smith operation but maintains operations in Little Rock, Arkansas and Guanghan, China. The Little Rock and Chinese operations were active in 2018. Notable for the company in 2018 was the initiation of barge shipments from Little Rock to effectively reduce transportation costs.
<b>Imerys Oilfield Solutions</b> <a href="http://www.imerys-oilfieldsolutions.com">www.imerys-oilfieldsolutions.com</a> 	Andersonville, GA *Closed Wrens, GA Domodossola, Italy	NS NS Truck	LWP	<b>Capacity: 0.500 billion lbs (250,000 tons)</b> Imerys, a large French based minerals company, initiated proppant production with the development of unconventional rod shaped ceramics in 2011, followed by traditional LWP in 2012 at C-E Minerals production facilities in Andersonville, GA. In 2013, the company acquired PyraMax™ Ceramics in Wrens, GA. The company mothballed its Andersonville (or Gemini) plant in early 2015 and one line at Wrens was operational in 2017-2018. Notable for the company in 2017/18 is the development and launch of ImerVert™, a fluid diversion agent and flowback control additive utilizing Propynite®.

# Resin Coat Consumption

Total Consumption (Billion lbs.)



# Oil Price Trends

## Cushing WTI and European Brent Spot Oil Prices (Jan. 2008-Jan. 2019 Monthly Ave.)

(Source: US Energy Information Administration, 2019)

