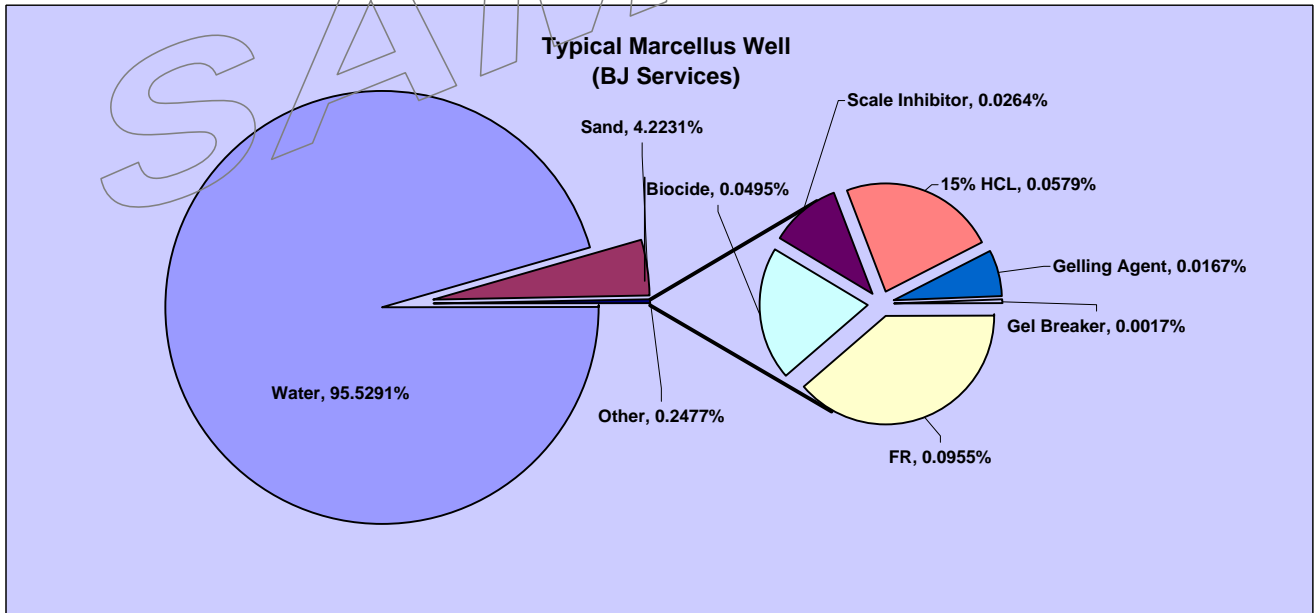




Typical Marcellus Well (BJ Services)

Product Name	Additive	Purpose	Use and Dilution	Volume per well (10 stages)	Overall %
Water	Carrier Fluid	Creates fracture network in shale and carry sand to the formation	Approximately 4 million gallons per well	4,127,000 gal	95.5291%
Sand	Sand	Enables fractures to remain open and allow gas to escape into the wellbore	Approximately 4 million pounds per well	182,446 gal	4.2231%
FR	Friction Reducer	Reduces friction between pipe and fluid	Diluted at one gallon per 1,000 gallons of water	4,127 gal	0.0955%
Biocide	Antimicrobial Agent	Eliminates bacteria in water sources	Diluted at one-half gallon per 1,000 gallons of water	2,137 gal	0.0495%
Scale Inhibitor	Scale Inhibitor	Prevents scale deposits	Diluted at one gallon per 1,000 gallons of water	1,142 gal	0.0264%
15% HCL	Acid	Dissolves cement and minerals in the perforations (non-diluted)	250 gallons per stage (non-diluted chemicals)	2,503 gal	0.0579%
Gelling Agent	Viscosifier	Adds viscosity to the fluid	Diluted at five gallons per 1,000 gallons of water	720 gal	0.0167%
Gel Breaker	Breaker	Reduces viscosity of fluid	Diluted at one-half gallons per 1,000 gallons of water	74 gal	0.0017%





Common Name & Supplier	Supplier Chemical Name	Common Description	Hazardous Component listed on MSDS	Purpose	Hazardous Component Weight % of Chemical	Component loading gal/1000 gal	Gal Hazardous Component / stage	Concentration Hazardous Component of Total Stage Fluid		
								by % Vol	by % Weight	ppm
15% HCL Mixture (BJS)	28% HCl	HCl Acid	Hydrochloric Acid	Dissolves cement and minerals in the perforations	28.00%	389.00	217.84	0.05419%	0.04991%	499.08
	CI-14	Corrosion Inhibitor	Propargyl Alcohol	Protects casing	5.00%	2	0.20	0.00005%	0.00005%	0.46
			Methanol		79.00%	2	3.16	0.00079%	0.00072%	7.24
			Polyoxyalkylenes		10.00%	2	0.40	0.00010%	0.00009%	0.92
			Fatty Acids		5.00%	2	0.20	0.00005%	0.00005%	0.46
			Olefin		1.00%	2	0.04	0.00001%	0.00001%	0.09
	Ferrotrol 300L	Iron chelator	Citric Acid	Prevents precipitation	70.00%	6	8.40	0.00209%	0.00192%	19.24
*Total 15% HCl system volume is 2,000 gallons per frac stage							<b>TOTAL</b>	<b>0.0573%</b>	<b>0.0527%</b>	<b>527.5</b>
Biocide (BJ Chem Svcs)	Alpha 1427	Biocide	Glutaraldehyde	Eliminates bacteria in water sources	25.00%	0.15	15.38	0.00383%	0.00304%	30.38
			Quaternary Ammonium Chloride		10.00%	0.15	6.15	0.00153%	0.00122%	12.15
			Alkyl dimethyl benzyl ammonium chloride		7.00%	0.15	4.31	0.00107%	0.00085%	8.51
			Ethanol		5.00%	0.15	3.08	0.00076%	0.00061%	6.08
							<b>TOTAL</b>	<b>0.0072%</b>	<b>0.0063%</b>	<b>57.1</b>
Scale Inhibitor (BJ Chem Svcs)	Scaletrol 720	Scale Control	Ethylene Glycol	Prevents scale deposits	25.00%	0.15	21.53	0.05419%	0.00425%	42.53
			Diethylene Glycol		5.00%	0.15	3.08	0.05419%	0.00061%	6.08
							<b>TOTAL</b>	<b>0.1084%</b>	<b>0.0049%</b>	<b>48.6</b>
Friction Reducer (BJS)	FRW-14	Friction Reducer	Hydrotreated light distillate	Reduces friction between pipe and fluid	40.00%	1	159.20	0.03960%	0.03146%	314.57
			Ethoxylated Alcohol		5.00%	1	19.90	0.00495%	0.00393%	39.32
							<b>TOTAL</b>	<b>0.0446%</b>	<b>0.0354%</b>	<b>353.9</b>
Gel (BJS)	GW-3LDF	Gelling Agent	Petroleum Distillate Blend(Non-Diesel, BTEX free)	Adds viscosity to fluid	50.00%	5	25.00	0.00622%	0.00612%	61.24
			Guar Gum		50.00%	5	25.00	0.00622%	0.00612%	61.24
Gel Breaker (BJS)	GBW-20C	Enzyme Gel Breaker	None	Reduces viscosity of the fluid	0.00%	0.50	0.00	0%	0%	0
							<b>TOTAL</b>	<b>0.0124%</b>	<b>0.0122%</b>	<b>122.5</b>

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