

#31 POET Biorefining - Shell Rock Ethanol Plant Energy and Water Usage vs. Cities within a 10 mile radius

Ethanol Plant without CO ₂ Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY		Comments
Ethanol Plant - Near Shell Rock, Iowa						
	POET Biorefining - Shell Rock Plant		578	393		Without CO ₂ capture water requirement
	Combined Towns All Water Usage		392.7	392.7		City residential use assumes 70 gal./person/day
1	Finchford	50	1.3	1.3		Water usage too small to require a permit
2	Plainsfield	393	10.0	10.0		Water usage too small to require a permit
3	Allison	966	24.7	24.7		
4	Janesville	1,034	26.4	26.4		
5	Clarksville	1,264	32.3	32.3		
6	Shell Rock	1,268	32.4	32.4		
7	Waverly	10,394	265.6	265.6		
	Percentage of ethanol plant usage of total water usage	15,369	59.5%	50.0%		
Conclusion: Without CO₂ Capture						
This ethanol plant consumes 50% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).						

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Ethanol Plant with CO ₂ Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY	2023 Water Usage % of Total	Comments
Ethanol Plant - Near Shell Rock, Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Finchford	50	1.3	1.3		Water usage too small to require a permit
2	Plainsfield	393	10.0	10.0		Water usage too small to require a permit
	No Permit	443	11.3	11.3	1.2%	
3	Allison	966	24.7	24.7	2.7%	
4	Janesville	1034	26.4	26.4	2.9%	
5	Clarksville	1264	32.3	32.3	3.5%	
6	Shell Rock	1268	32.4	32.4	3.5%	
7	Waverly	10394	265.6	265.6	28.8%	
8	Ethanol plant water for Ethanol Production		578.0	393.0	42.6%	Without CO ₂ Capture water requirement
9	Ethanol Plant water for CO ₂ Capture		137.6	137.6	14.9%	Additional CO ₂ Capture water requirement
Total Plant and Towns		15,369	1108.2	923.2	100.0%	
Percentage of ethanol plant usage of total water usage			64.6%	57.47%		
Conclusion: With CO₂ Capture						
This ethanol plant consumes 57% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)						
*Ethanol Production Capacity of Plant - MGY		131				
Factor: Water required to cool and compress the CO₂ for capture - MGY Water/ MGY Ethanol		1.05				
Calculate additional water required for CO₂ Capture - MGY		137.55				
Calculate ratio of gallons of water/ gallons of Ethanol		3.0				
Total water requirement of towns and Ethanol plant - MGY		934.5				
Total water requirement of towns - MGY		404.0				
Total water requirement for ethanol plant - MGY		530.6				
Ratio of ethanol plant water use vs. surrounding area		1.31				
Percentage of ethanol plant usage of total water usage		56.8%				
Total Population within the 10 mile radius		15,369				

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Water Use					
Typical water use per person per day - Gallons/ person/ day	70				
Equivalent # of people ethanol plant water use w/o CO2 capture	15,382				
Equivalent # of people ethanol plant water use w/ CO2 capture	20,765				
Electricity Use					
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6				
Total Electricity used to produce ethanol - kWh	78,600,000				
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377				
Total Electricity used to capture CO2 - kWh	49,387,000				
Total electricity to produce ethanol and capture CO2 - kWh	1.280E+08				
Typical electrical use/ residence - kWh/year	10,476.0				
Equivalent number of residences	12,217.2				
Number of people / residence	2.4				
Equivalent number of people	29,321				
Natural Gas Use					
Natural gas use per gallon of ethanol for production - BTU's/ gal.	26,000				
Natural gas use for ethanol plant - BTU's	3.406E+12				
Natural gas use per gal. of ethanol for CO2 capture - BTU's/ gal.	0				
Typical Natural Gas use/ residence - BTU's/ year	96,000,000				
Equivalent number of residences	35,479				
Number of people / residence	2.4				
Equivalent number of people	85,150				
* Ethanol Capacity per Iowa Renewable Fuels Association		** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.			

#31 POET Biorefining Ethanol Plant (131 MGY) near Shell Rock

Ethanol plant 2023 water usage vs. surrounding residential water usage of towns within a ten mile radius MGY (Millions of Gallons per Year).

No Permit cities:
Finchford
Plainsfield

No Permit, 11.3, 1.2%

Allison, 24.7, 2.7%

Janesville, 26.4, 2.9%

Clarksville, 32.3, 3.5%

Shell Rock, 32.4, 3.5%

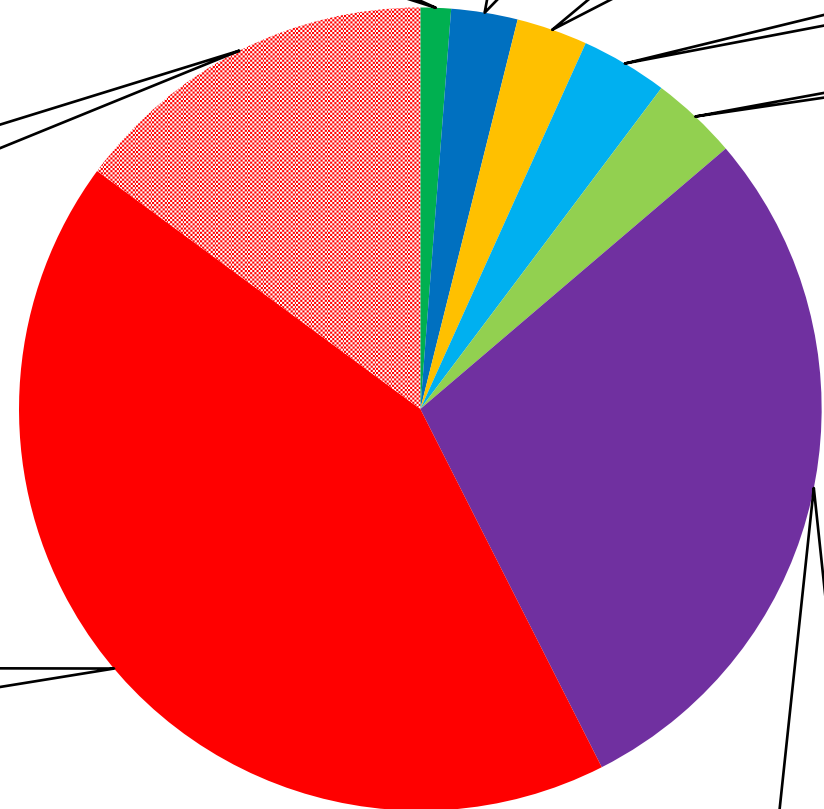
Ethanol Plant water for CO2 Capture, 137.6, 14.9%

The plant uses 1.3 times as much water as all the surrounding cities within a 10 mile radius.

Ethanol plant water for Ethanol Production, 393.0, 42.6%

3.0 gallons of water per gallon of ethanol is used for production. An additional 1.05 gallon is required for CO2 capture.

The plant draws it's water from the Devonian aquifer This water level in this area is down as much as 30 feet since 2015



With the proposed CO₂ capture system the POET Biorefining Shell Rock plant will use 57% of the total water used by the plant and cities within the surrounding 10 mile radius. (314 square miles)

With combined production and CO₂ capture the ethanol plant power and 2023 water usage would be equivalent to:
Water: 20,800 people.
Electricity: 29,300 People.
Natural Gas: 85,200 People

The total population of the cities within the 10 mile radius is 15,369.