

#8 Golden Grain Energy - Mason City 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 Mason City, Iowa						
	Golden Grain Energy - Mason City Plant		683.0	405.0		Without CO ₂ capture water requirement
	Combined Towns All Water Usage		776.7	776.7		City residential use assumes 70 gal./person/day
1	Portland	50	1.28	1.28		Water usage too small to require a permit
2	Rock Falls	150	3.83	3.83		Water usage too small to require a permit
3	Rudd	358	9.15	9.15		
4	Plymouth	375	9.58	9.58		
5	Rockford	758	19.37	19.37		
6	Nora Springs	1,369	34.98	34.98		
7	Mason City	27,338	698.49	698.49		
	Percentage of ethanol plant usage of total water usage	30,398	46.8%	34.3%		
Conclusion: Without CO₂ Capture						
This ethanol plant consumes 34% 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 Mason City, Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Portland	50	1.3	1.3	0.10%	Water usage too small to require a permit
2	Rock Falls	150	3.8	3.8	0.29%	Water usage too small to require a permit
	No Permit	200	5.1	5.1	0.4%	
3	Rudd	358	9.1	9.1	0.7%	
4	Plymouth	375	9.6	9.6	0.7%	
5	Rockford	758	19.4	19.4	1.5%	
6	Nora Springs	1369	35.0	35.0	2.6%	
7	Mason City	27338	698.5	698.5	52.8%	
8	Ethanol plant water for Ethanol Production		683.0	405.0	30.6%	Without CO ₂ Capture water requirement
9	Ethanol Plant water for CO ₂ Capture		141.8	141.8	10.7%	Additional CO ₂ Capture water requirement
	Total Plant and Towns	30,398	1601.4	1323.4	100.0%	
	Percentage of ethanol plant usage of total water usage		51.5%	41.3%		
Conclusion: With CO₂ Capture						
This ethanol plant consumes 41% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)						
*Ethanol Production Capacity of Plant - MGY		135				
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		141.75				
Calculate ratio of gallons of water/ gallons of Ethanol		3.0				
Total water requirement of towns and Ethanol plant - MGY		1328.5				
Total water requirement of towns - MGY		781.8				
Total water requirement for ethanol plant - MGY		546.8				
Ratio of ethanol plant water use vs. surrounding area		0.70				
Percentage of ethanol plant usage of total water usage		41.2%				
Total Population within the 10 mile radius		30,398				

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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	15,851				
Equivalent # of people ethanol plant water use w/ CO2 capture	21,399				
Electricity Use					
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6				
Total Electricity used to produce ethanol - kWh	81,000,000				
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377				
Total Electricity used to capture CO2 - kWh	50,895,000				
Total electricity to produce ethanol and capture CO2 - kWh	1.319E+08				
Typical electrical use/ residence - kWh/year	10,476.0				
Equivalent number of residences	12,590.2				
Number of people / residence	2.4				
Equivalent number of people	30,216				
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	3.510E+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	36,563				
Number of people / residence	2.4				
Equivalent number of people	87,750				
* Ethanol Capacity per Iowa Renewable Fuels Association		** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.			

#8 Golden Grain Energy Ethanol Plant (135 MGY) near Mason City

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

