

### #4 Little Sioux Corn Processors Ethanol Plant Energy and Water Usage vs. Cities within a 10 mile radius

Ethanol Plant without CO <sub>2</sub> Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY		Comments
Ethanol Plant - Near Marcus Iowa						
	Little Sioux Corn Processors Marcus Plant		1036.1	645.8		Without CO <sub>2</sub> capture water requirement
	Combined Towns All Water Usage		82.0	82.0		City residential use assumes 70 gal./person/day
1	Germantown	50	1.3	1.3		Water usage too small to require a permit
2	Meridan	161	4.1	4.1		Water usage too small to require a permit
3	Cleghorn	240	6.1	6.1		
4	Marcus	1,079	27.6	27.6		
5	Remsen	1,678	42.9	42.9		
	Percentage of ethanol plant usage of total water usage	3,208	92.7%	88.7%		
<b>Conclusion: Without CO<sub>2</sub> Capture</b>						
This ethanol plant consumes 89% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles).						

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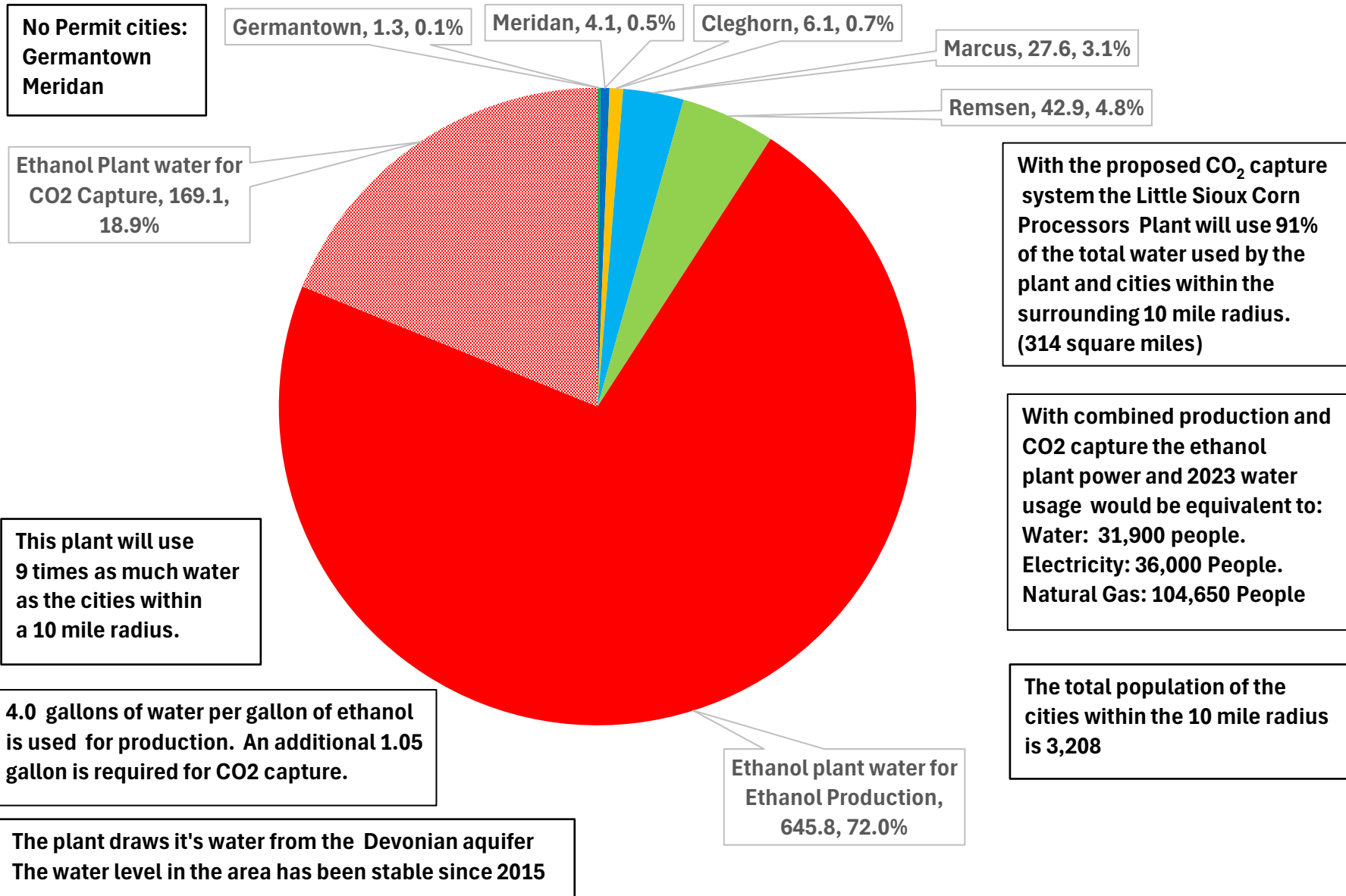
Ethanol Plant with CO <sub>2</sub> Capture						
No.	Ethanol Plant/ Town	Population	**Water Permit Value MGY	**2023 Water Usage MGY	2023 Water Usage % of Total	Comments
Ethanol Plant - Near Marcus Iowa		-	-	-	-	City residential use assumes 70 gal./person/day
1	Germantown	50	1.3	1.3	0.1%	Water usage too small to require a permit
2	Meridan	161	4.1	4.1	0.5%	Water usage too small to require a permit
3	Cleghorn	240	6.1	6.1	0.7%	
4	Marcus	1079	27.6	27.6	3.1%	
5	Remsen	1678	42.9	42.9	4.8%	
6	Ethanol plant water for Ethanol Production		1036.1	645.8	72.0%	Without CO <sub>2</sub> Capture water requirement
7	Ethanol Plant water for CO <sub>2</sub> Capture		169.1	169.1	18.9%	Additional CO <sub>2</sub> Capture water requirement
Total Plant and Towns		3,208	1287.1	896.8	100.0%	
Percentage of ethanol plant usage of total water usage			93.6%	90.9%		
<b>Conclusion: With CO<sub>2</sub> Capture</b>						
This ethanol plant consumes 91% of the water used by the cities and plant within the surrounding 10 mile radius (314 square miles)						
<b>*Ethanol Production Capacity of Plant - MGY</b>		<b>161</b>				
<b>Factor: Water required to cool and compress the CO<sub>2</sub> for capture - MGY Water/ MGY Ethanol</b>		<b>1.05</b>				
<b>Calculate additional water required for CO<sub>2</sub> Capture - MGY</b>		169.05				
<b>Calculate ratio of gallons of water/ gallons of Ethanol</b>		4.0				
<b>Total water requirement of towns and Ethanol plant - MGY</b>		896.8				
<b>Total water requirement of towns - MGY</b>		82.0				
<b>Total water requirement for ethanol plant - MGY</b>		814.8				
<b>Ratio of ethanol plant water use vs. surrounding area</b>		9.94				
<b>Percentage of ethanol plant usage of total water usage</b>		90.9%				
<b>Total Population within the 10 mile radius</b>		3,208				

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<b>Water Use</b>						
Typical water use per person per day - Gallons/ person/ day	70					
Equivalent # of people ethanol plant water use w/o CO2 capture	25,275					
Equivalent # of people ethanol plant water use w/ CO2 capture	31,891					
<b>Electricity Use</b>						
Electricity to produce Ethanol - kWh/ gallon EtOH for production	0.6					
Total Electricity used to produce ethanol - kWh	96,600,000					
Electrical use to capture CO2 - kWh/ gallon EtOH	0.377					
Total Electricity used to capture CO2 - kWh	60,697,000					
Total electricity to produce ethanol and capture CO2 - kWh	1.573E+08					
Typical electrical use/ residence - kWh/year	10,476.0					
Equivalent number of residences	15,015.0					
Number of people / residence	2.4					
Equivalent number of people	36,036					
<b>Natural Gas Use</b>						
Natural gas use per gallon of ethanol for production - BTU's/ gal.	26,000					
Natural gas use for ethanol plant - BTU's	4.186E+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	43,604					
Number of people / residence	2.4					
Equivalent number of people	104,650					
* Ethanol Capacity per Iowa Renewable Fuels Association		** Water usage per the greater of DNR WACOP Permit or 3 times ethanol capacity.				

# #4 Little Sioux Corn Processors Ethanol Plant (161 MGY) near Marcus

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:  
Germantown  
Meridan

Ethanol Plant water for CO2 Capture, 169.1, 18.9%

This plant will use 9 times as much water as the cities within a 10 mile radius.

4.0 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  
The water level in the area has been stable since 2015

With the proposed CO<sub>2</sub> capture system the Little Sioux Corn Processors Plant will use 91% 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: 31,900 people.  
Electricity: 36,000 People.  
Natural Gas: 104,650 People

The total population of the cities within the 10 mile radius is 3,208

Ethanol plant water for Ethanol Production, 645.8, 72.0%