



Graycliff Mill is a historic inspired food production site in Graycliff, Montana, established in 2021. Although the facility opened only a few years ago, its structural elements include a barn frame from 1760 and a gristmill dating back to 1874, relocated from earlier U.S. locations and restored as part of the project.



The Mill sits along the I-90 corridor between Billings and Bozeman and combines heritage architecture with modern operational use as a working production site and visitor destination.

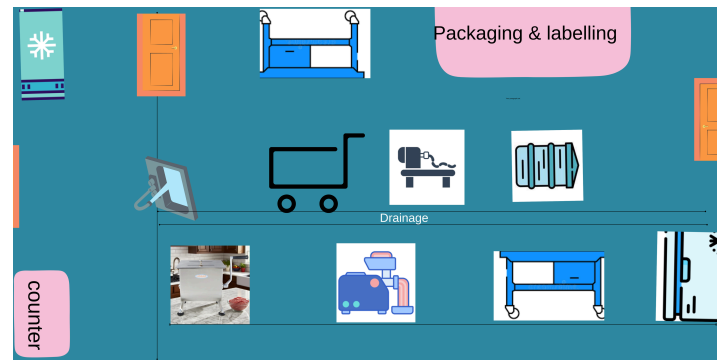
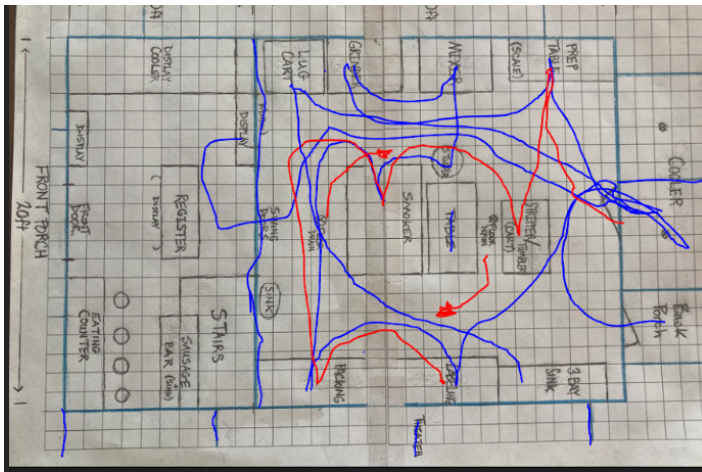
A standout feature is the underground Cheese Cave, a naturally arched aging room maintained at approximately 50 °F with 85% humidity where artisan cheese is crafted and aged on-site.

The facility also includes a café and market offering freshly milled flour, local pastries, espresso drinks, and other farm-to-table products. Graycliff Mill supports Montana's local agriculture by sourcing grain regionally and promoting sustainable food systems. It also functions as an educational attraction—offering tours, creamery demonstrations, and community events that showcase heritage food craft and rural innovation.

Internship Experience

During my internship at Graycliff Mill in Montana, I was tasked with supporting the development of a new smokehouse for sausage production and improving operational efficiency in the Cheese Cave. The main objective was to identify existing and potential sources of waste and propose solutions that would support a more sustainable and energy-efficient production process.

To inform this work, I visited Pioneer Meats, an established meat processing facility, to observe their sausage production process from start to finish. This included meat preparation, grinding, mixing with spices, stuffing into casings, hanging, smoking, cooling, packaging, and final storage or distribution. Based on these observations, I conducted a Value Stream Mapping (VSM) analysis to assess the workflow and identify areas of waste using the DOWNTIME framework. The most prominent forms of waste observed were transportation, due to inefficient movement of materials between processing steps, motion, caused by excess manual handling and walking, and energy inefficiencies, largely from equipment without heat recovery systems. While time constraints limited the ability to calculate precise energy consumption figures, the analysis provided enough insight to support the redesign of the proposed layout at Graycliff Mill. We also helped confirm energy-efficient equipment options that could be used in the new smokehouse to reduce long-term utility costs and environmental impact. Fig 1a: shows the initial Smokehouse layout and Fig 1b: shows new plant layout.



n the Cheese Cave, I played a key role in reducing operational costs and improving efficiency by identifying a more cost-effective vendor for pasteurized milk instead of unpasteurized milk. This strategic change significantly lowered transportation expenses, eliminated the need for on-site pasteurization, and reduced both water and energy consumption that would have otherwise been used during the pasteurization process. Additionally, I recommended repairing the union valve, which resulted in saving approximately 360 gallons of water.

One major source of waste I identified was whey, a by-product of the cheese-making process. Currently, around 65 gallons of whey are discarded behind the facility. To address this, I proposed repurposing the whey into marketable whey powder using a freeze-drying process, which could be implemented at a cost of approximately \$3 per gallon.

P2 Outcome

if Implemented					if not Implemented	
	Annual Reductions					
Recommended Action	One-time cost to implement	Annual savings from P2 Action (\$)	Water usage saved (gallons/ annum)	Gas usage saved gallons/ annum)	Barriers to Implementation	Plans to implement within 5 years?
Eepair Leaking valve	\$8		17,280		Time Constrains	yes
change Milk vendor	–	13000	–	2080	–	Yes
Repurpose Whey	\$190	19680	2,880			Yes



Additional Recommendation

Use chlorine test strips to periodically verify the sanitizer concentration stays within the effective 100–200 ppm range.

Enclose or cover dispensing pipes to prevent exposure to environmental contaminants like insects, sand, mold

In conclusion, the MTP2 program has enhanced my skills in Value Stream Mapping, LEAN methodologies, and field data interpretation to promote cost-saving and sustainable improvements. The Greycliff team was welcoming and open to the solutions I presented, fostering strong stakeholder collaboration and reinforcing Greycliff's dedication to operational efficiency and environmental stewardship.

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