



Industrial User Facility Inspection Report U.S. EPA, Region 8

Name of industry and location:

Meati Foods
14381 Washington Street
Thornton, CO 80303

Control Authority / NPDES Permit No.

Metro Water Recovery
NPDES Permit No. CO-0026638 and CO-0048959

IU – NPDES ID

COPIU008N

Date of visit:

April 18, 2024

Approximate Time of visit:

1000 – 1420

Name(s) / Affiliation / email of inspector(s):U.S. EPA:

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Metro Water Recovery:

Amy Burk, aburk@metrowaterrecovery.com
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General Facility Information:Representatives at Inspection:

- Joe Johnston – VP – Engineering/Quality/Regulation, Joe.Johnston@meati.com
- Eric Daniels – Environmental, Health and Safety Manager
- Ismael Nieves – VP – Research and Development
- Rachel Jones – Director of Food Process
- Pierre Jullin – Project Manager
- Andrea Wombacher – Director of Plant Operations
- Brandon (??) – Maintenance Department
- Justin (??) – Fermentation Plant Operator
- Dave Rau, Environmental Consultant – Paragon Consulting

Type of Business Operations:

- Manufacturing and processing of meat alternative products.

Facility Information:

- Seven days/week.
- Two 12-hour shifts.

Inspection Description:

Al Garcia, Stephanie Passarelli, and Althea Wilson from the U.S. Environmental Protection Agency (EPA) and Amy Burk, Tony Langowski, and Bret Icenogle from Metro Water Recovery (MWR) conducted a significant industrial user (SIU) inspection of the Meati Foods facility (facility) located on 14381 Washington Street, Thornton, CO 80303. The SIU inspection was conducted as part of the EPA Pretreatment Audit of MWR's Publicly Owned Treatment Works (POTW) and EPA-approved Pretreatment Program. The inspection of the facility provides current conditions of the facility's unit operations and consisted of an evaluation of the wastestreams generated from the unit operations, management of these wastestreams, including potential for spills and slug discharges. The facility discharges to the sewer collection system owned by the City of Thornton, conveying wastewater to MWR's Northern Treatment Plant POTW.

Upon arriving at the facility on April 18, 2024, at approximately 10:00 a.m., the EPA presented credentials to the facility representatives and explained the purpose of the inspection. During the opening interview, the facility representatives provided an overview of the operations and processes at the facility, wastestreams generated and management/discharge of these wastestreams. The opening interview was followed by a facility tour to visually inspect the unit operations. The EPA conducted a closing conference to discuss observations, potential findings and recommendations identified during the inspection.

Process Description:

The facility located at 14381 Washington Street, Thornton, CO 80303 manufactures alternative meat products by cultivating a mycelium biomass in fermentation vessels and harvesting the biomass for processing into cutlets. The manufacturing of the fermentation and food process is contained in a 114,700 square foot building, consisting of North and South processing plants. The Google Maps view of the facility is shown in Figure 1.

South and North Plants –

The facility began operations in the South plant in 2022 while it was constructing the North plant. The facility began operations in the North plant primarily in October 2023. The facility has mycelium cultivation/fermentation production capabilities in both the North and South plants. Currently, the fermentation production and thermoforming of the harvested mycelium biomass is performed in the North plant and most of the food processing operations are performed in the South plant. The fermentation process descriptions are similar in the North and South plants with a difference in scale and configuration. During the facility tour portion of the facility inspection, the fermentation operation in the North Plant was visually inspected because the fermentation operation was not currently performed in the South Plant.

Chemical/Raw Material Storage –

In general, the facility has the following chemicals/raw materials (North and South Plants). The dry and liquid ingredients are delivered to the warehouse area using delivery bay doors, located on the west side of the North and South Plants. The large bulk liquid ingredients are stored in totes or 55-gallon barrels in large fire-rated cabinets. Based on observations during the facility tour, 55-gallon barrels of chemicals used in sanitization, boiler treatment and waste treatment are stored on containment pallets or in storage/containment containers.

- Clean in Place (CIP)
 - Caustic – stored in 330-gallon totes.
 - Acid – stored in 330-gallon totes.
 - Peracetic Acid Sanitizer – 55-gallon barrels.
- Fermentation
 - Growth ingredients (seed culture) – vials stored in freezers.
 - Potassium hydroxide (22.5%) – 55-gallon barrels and (45%) – 275-gallon totes.
 - High fructose corn syrup (bulk sugar) tanks (North and South Plant) – 6,600-gallons, the tanks are filled about every two to three days in the North Plant using by directly pumping the bulk

sugar product using stainless steel piping. Based on observations during the facility tour, the bulk sugar delivery system to the North Plant consists of stainless-steel connection ports housed within a locked cabinet mounted on the outside northern wall of the building. It does not appear that the North Plant stainless steel delivery location has adequate containment or measures should a spill occur. A spill from the delivery trucks would go directly on landscape and potentially, the storm sewer.

- Ammonium Sulfate – 50-lb bags
- Potassium phosphate – 50-lb bags
- Sodium Chloride – 50-lb bags
- Surfactant – 275-gallon totes
- Defoamer – 275-gallon totes
- Nutrients: (stored in dry form)
 - Zinc sulfate
 - Copper sulfate
 - Manganese sulfate
 - Iron Sulfate
 - Trisodium citrate
- Waste Treatment
 - Sodium hydroxide_(sol) – 30% - 55-gallon barrels
 - Sulfuric acid_(sol) – 50% - 55-gallon barrels
- Utilities
 - Boiler Treatment Chemicals/Descalants – 55-gallon to 75-gallon barrels
- Food Processing 3-compartment Sinks
 - Chlorinated degreaser – 15-gallon container
 - Sanitizer – 15-gallon container

Mixing Room and Raw Materials Handling –

The micronutrients are contained in a dry storage area, located next to the mixing room. The dry ingredient nutrients are manually added to two hoppers for mixing with water, according to proprietary recipes. Based on information gathered during the facility tour, spilled dry ingredients are swept up for disposal or washed down the drain. These nutrient mixtures are contained in dedicated 1,320-gallon micro-nutrient tanks. The phosphorus and nitrogen source raw materials are mixed in dedicated macro-nutrient tanks. The macro- and micro-nutrient tanks are the food source for the mycelium culture/fermentation tanks and the facility maintains both nitrogen/phosphorus tanks and nutrient tanks, four tanks in the North plant and two tanks in the South plant. The nutrient tanks are blended with high fructose corn syrup and water, according to proprietary recipes in a manifold and are sterilized prior to fermentation. The sterilization process uses ultra-high temperature (UHT) with heat exchangers to heat the blended solution to 134° C for 1 minute and then cooled to 32°C. The UHT- sterilized blended solution is sent to the fermentation vessels to become the food source for the mycelium seed culture, previously inoculated with media and allowed to propagate overnight.

Fermentation Process –

The facility's fermentation vessels are organized in fermentation process trains consisting of the following vessel sizes:

- 50L working volume
- 1,250L working volume
- 25,000L working volume

The North plant has eight (8) fermentation process trains, and the South plant has four (4) fermentation process trains. The blended and sterilized mixture of macro- and micro-nutrients and high fructose corn syrup (sugar)

are added to the 50L vessel with the mycelium seed culture and is allowed to propagate. The mycelium biomass, once fully propagated within the 50L vessel is transferred to the 1,250L fermentation vessel for further propagation, along with a supply of blended and sterilized nutrients/sugar solution. During transfer from the 50L tank, about 20% of the fermented biomass volume is kept as a heel to act as a starter culture for the next batch. Similarly, once the mycelium biomass is fully propagated within the 1,250L fermentation vessel, the contents are pumped to the 25,000L fermentation vessel, except for about 20% of fermented biomass volume kept in the tank to act as a starter culture. The mycelium biomass, once fully propagated in the 25,000L fermentation vessel is harvested and transferred to the processing area, except for about 20% of fermented biomass volume left behind to act as a starter culture. During the fermentation process, potassium hydroxide may be dosed to control pH within the tanks.

The harvest production run within each process train in the North plant lasts for five days and produces eight harvests of the mycelium biomass in the 25,000L fermentation tank. The production in the eight fermentation process trains (50L/1,250L/25,000L vessels) are staggered in the North plant to ensure daily harvesting. Heel starter cultures (20% of tank volumes) are left in each fermentation tank for the 1st seven batches, then 100% of the fermented biomass volume is transported on the 8th batch, prior to the CIP/SIP cleaning protocol. The vessels are CIP using caustic, acid and peracetic acid sanitizers and are steamed in place. The CIP cycle includes a pre-rinse stage, followed by caustic wash/rinse/acid-peracetic acid wash stages and a post-rinse stage. The facility generates approximately 1,500L of CIP wastewater from the 50L vessel, 5,000L of CIP wastewater from the 1,250L vessel and about 18,000L of CIP wastewater from the 25,000L vessel. These wastewaters are pumped to the wastewater treatment system.

Based on observations during the facility inspection, it appears that the facility has a significant potential for off spec or non-routine batches to occur. According to the Mr. Johnston, the facility will attempt to re-work the mycelium biomass in the fermentation tank to recover the batch. However, if the batch cannot be recovered, the batch is discharged to waste treatment. This was confirmed, based on a conversation with a fermentation plant operator and observations of “dump it” signs used on the visual operator tank-status whiteboard. According to Ms. Jones, the facility performs calculations to ensure the dumped batches do not cause the facility to exceed its phosphorus limit of 144 lbs/day. Based on a conversation with Mr. Johnston on April 22, 2024, the facility is developing a protocol to press out the solids for the non-routine batches or slug discharges and dispose of the pressed solids as a waste product.

A significant percentage (96%) of the propagated biomass culture broth in the 25,000L vessel is water that is drained out of the 25,000L tank and sent to the wastewater treatment system. The remaining 4% of the volume or the mycelium biomass is sent to the processing areas of the plant.

Food Processing –

The mycelium biomass in the harvest is pumped to the food processing room located in the North plant where it is placed along a long fabric belt and is transported through rinsing bars. The wastewater from the rinsing process is sent to the wastewater treatment system. The rinsed biomass is allowed to cool and is transferred to 12,500L dilution tanks. The facility has three dilution tanks in the North plant and three dilution tanks in the South plant. The mycelium biomass from the dilution tanks in the North plant are pumped to three 1,800-gallon batch tanks where ingredients are added to produce the alternative chicken or steak products. The South plant does not have batch tanks; therefore the ingredients are added directly into the dilution tanks. The batch tanks are CIP every 10 days and generate about 5,000L of wastewater per CIP cycle. The North batch tanks are CIP every 10 days and generate about 3,800L of wastewater per CIP cycle.

The mycelium biomass mixed with the product ingredients (batch tanks in the North plant and dilution tanks in the South Plant) are sent to the Mold Fill Presses (MFP) to press out water in the product. The facility has twenty MFP in the North plant and nine MFP in the South plant. The mycelium biomass is about 5% solid going into the MFP conical tanks and the moisture is pressed out resulting in a block of mycelium at about 23% solid. The MFP components are cleaned-out-of-place (COP) by disassembling the MFP components and

placing them in in two COP tanks at a frequency of about every 10 days. The wastewater from the COP tanks is discharged to the waste treatment system.

The mycelium blocks from the MFPs are collected on conveyors and are transported to the slicers to form cutlets and are laid out in trays. The cutlets are cooked in either batch ovens in the North Plant (Note: the North plant batch ovens are currently undergoing quality control certifications for use in production) or transported to the continuous oven in the South Plant.

The cooked cutlets are sent to the spiral chiller, located in the South plant. The classic steak or chicken cutlets have completed their processing and are sent to the freezer, then packaged in cartons and the cases of cartons are palletized and stored in freezers until shipped. The frozen classic steak or chicken cutlets are also further processed into Carne Asada steak or Crispy Cutlets (chicken). The steak cutlets are taken from the freezer, debagged and are manually coated with spices, thermal formed, refrozen and then packaged for shipping. The frozen chicken cutlets are removed from the freezer, debagged, battered and fried. The fried chicken cutlets are thermal formed, frozen, then packaged for shipping.

The spent oil from the fryers is collected in a waste oil container and hauled offsite. The fryers are cleaned after a frying production run, and the wastewater is collected in a sump. The contents of the sump are pumped to a 500-gallon two-chamber grease interceptor. The grease interceptor effluent is plumbed to the South plant wastewater treatment system. According to Mr. Johnston, the grease interceptor is cleaned/maintained by Colorado Plumbing.

Wastewater Treatment (North and South Plants) –

The process wastewaters from the North Plant unit operations are collected in the North plant lift station. The North lift station is aerated and has three pumps to lift the collected wastewater through strainers and to the 150,000-gallon equalization tank. The equalization (EQ) tank is constantly agitated, and the pH of the wastewater within the EQ tank is neutralized to a pH setpoint of 5.8 to 11.0. using caustic and acid. If the pH setpoints are met and when the volume in the EQ tank is at a certain level, wastewater is continuously discharged through monitoring point (MP) 002 to the City of Thornton's collection system, leading to Metro Water Recovery's Northern Treatment Plant. MP 002 consists of a flow meter, sampling ports and a reportable compliance pH probe and is designed with a pipe riser prior to discharge into the sewer manhole to allow the pH probe to remain wet/humid.

During the inspection, the EPA and facility representatives discussed the pH monitoring conditions at MP 002 during situations where it does not appear that discharges are occurring. According to Mr. Johnston and Mr. Rau, when a discharge is not occurring, wastewater remains in the pipe and results in erroneous pH readings because there is not an active discharge from the EQ tank. The EPA is uncertain whether pH measurements during periods of no discharge are a result of 'pH drift'. It is possible that the pH measurements are a reflection of wastewater quality occurring downstream in the collection system, as a result of biological activity and the effect on pH. Based on information gathered during the inspection, the facility uses potassium hydroxide to neutralize pH, as a result of biological activity in the fermentation process. The EPA recommends the facility investigate the discharge of mycelium biomass at MP 001 and MP 002, the resulting biological activity that may impact pH and ensure it is adequately controlling its impact to the City of Thornton's sewer collection system and MWR Northern Treatment Plant.

Process wastewater generated from the South plant unit operations are collected in the waste treatment sump and are pumped to a 15,000-gallon holding tank. The wastewater from the holding tank is discharged through two pH treatment skids to be neutralized by dosing caustic and acid, depending on the wastewater pH characteristics. The pH treated wastewater is sent to a lift station and is discharged through MP 001 to the City of Thornton sewer collection system. MP 001 is a constructed monitoring manhole with a Parshall flume and primary flow metering capabilities. During the facility tour, the facility was sampling using an ISCO automatic sampler actuated by a primary flow monitoring device at MP 001, however, the EPA observed the sampling

probe for the ISCO automatic sampler incorrectly placed in the converging section or upstream of the flume throat, potentially affecting the flow monitoring accuracy.



Figure 1 - Meati Foods - Google Earth View

Spill History –

Based on information gathered during the inspection and during the EPA's review of Meati Foods

Pretreatment Records, the facility has experienced the following spills since its opening on or about June 2022:

- 12/13/2023 – North plant lift station pumps plugged with mycelium. About 700 gallons of wastewater overflowed from the lift station to the storm drain.
- 12/23/2023 – North plant lift station pumps plugged with mycelium, about 1,500 gallons of wastewater overflowed from the lift station to the storm drain.
- 01/07/2024 – North Plant sewer manhole downstream of MP 002 overflowed to storm drain discharging approximately 1,500 gallons. According to the facility, the downstream sewer line was inspected using a sewer camera, but no cause of the overflow was determined.
- 02/14/2024 – Sampling of MP 002 at the sampling port was disrupted because of freezing temperatures. The sample probe became disconnected and about 6,000 gallons of wastewater flowed out of the open sample port and reached the storm drain.

EPA Classification of the Industrial User

MWR has characterized the facility as a significant industrial user (SIU), subject to the Pretreatment Standards found in MWR's local limits and general/specific wastewater discharge prohibitions. Based on observations and information received during the inspection, the EPA agrees with MWR's characterization of the SIU.

Summary of Findings

Meati Foods
NPDES ID# COPIU008N
April 18, 2024

Pretreatment Inspection Findings	Follow up Action Items
1. Based on information gathered during the facility inspection, Meati Foods has a significant potential of off spec fermentation batches. At the time of the facility inspection, the off spec or non-routine batches were dumped to the wastewater treatment system, after calculations of the phosphorus loading limits implemented by the MWR October 3, 2023, permit modification. However, it does not appear the facility is considering other compliance limits in the MWR permit when determining the management of these non-routine or slug discharges. Based on an April 22, 2024, conversation with Mr. Joe Johnston, the facility is re-evaluating management methods for these non-routine batch discharges and have pressed out solids for a slug discharge that recently occurred on Friday, April 19, 2024. The solids were disposed as solid waste instead of dumping the entire batch to the wastewater treatment system.	<u>Pretreatment Requirements</u> 40 C.F.R. § 403.8(f)(2)(vi) <u>Corrective Action Item</u> Update the current slug discharge control plan to address the non-routine or slug load discharges from the fermentation process, and management of these discharges occurring at the facility. In addition, the current slug discharge control plan addresses bulk sugar storage inside the facility but does not specifically address the following for the bulk sugar/high fructose corn syrup delivery to the North plant: • Procedures to prevent adverse impact from accidental spills, including inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site run-off,

In addition, the facility has not constructed adequate structures or measures to contain leaks or spills that may occur during the outside delivery of bulk sugar or high fructose corn syrup to the North Plant. The Pretreatment Regulations at 40 C.F.R. § 403.8(f)(2)(vi) require the facility to control slug discharges defined as “any discharge of a non-routine, episodic nature, including but not limited to an accidental spill or a non-customary batch discharge, which has a reasonable potential to cause Interference or Pass Through, or in any other way violate the POTW's regulations, local limits or Permit conditions.” A slug discharge control plan shall contain, at a minimum, the following elements: (A) Description of discharge practices, including non-routine batch Discharges. (B) Description of stored chemicals. (C) Procedures for immediately notifying the POTW of Slug Discharges, including any Discharge that would violate a prohibition under 40 C.F.R § 403.5(b) with procedures for follow-up written notification within five days. (D) If necessary, procedures to prevent adverse impact from accidental spills, including inspection and maintenance of storage areas, handling and transfer of materials, loading and unloading operations, control of plant site run-off, worker training, building of containment structures or equipment, measures for containing toxic organic pollutants (including solvents), and/or measures and equipment for emergency response.	worker training, building of containment structures or equipment, and/or measures and equipment for emergency response.
2. The Meati Foods permit at section F.3 issued by MWR on October 3, 2023, requires the facility to “In the event of an accidental, unusual or slug discharge, the Permittee shall immediately notify the Connector and Metro by telephone. An accidental or slug discharge report must also be submitted within five (5) working days after commencement of the discharge.” Based on the EPA’s review of the facility’s Pretreatment records, it does not appear that the facility has been providing notification and reporting these slug discharges.	<u>Pretreatment Requirements</u> 40 C.F.R. § 403.8(f)(2)(vi) Meati Foods Permit # 11843-1-1A, Section F.3 <u>Corrective Action Item</u> Provide immediate notification and follow up reports of slug discharges, as required by Section F.3 of Permit #11843-1-1A.
3. Based on observations during the facility tour, the sample probe for the ISCO automatic sampler was incorrectly placed in the converging section of the Parshall flume at MP 001. The placement of the	<u>Pretreatment Requirements</u> 40 C.F.R. § 403.12(g)(3)

probe affects the wastewater flow, upstream of the primary flow monitoring device, potentially resulting in erroneous flow measurements.

The Pretreatment Regulations at 40 C.F.R. § 403.12(g)(3) require the facility to submit periodic compliance reports based upon data obtained through appropriate sampling and analysis performed during the period covered by the report, which data are representative of conditions occurring during the reporting period.

Corrective Action Item

The ISCO automatic sampler probe must be placed in the diverging section of the Parshall flume or downstream of the primary flow monitoring device to ensure the probe does not affect flow monitoring and is representative of conditions.

Report Review and Signature		
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