



United States Environmental Protection Agency Region 4
Clean Water Act – Wastewater Field Report
PT – DSM – 022322

SECTION A: Data System Coding

NPDES No.	MO/DAY/YR	Inspection-Type	Lead Inspector	Facility-Type
N/A	2/23/2022	IU (Industrial User Inspection)	David Phillips	Industrial User

SECTION B: Basic Field Data

Name and Location of Facility Inspected: (For industrial users, add recipient POTW's NPDES permit number)	Entry Date/Time: 2/23/2022 1:49 PM	Permit Eff Date: Local
DSM Nutritional Products, LLC 1416 N. Williamsburg County Highway Kingstree, SC 29556 Receiving POTW: SC0035971	Exit Date/Time: 2/23/2022 6:00 PM	Permit Exp Date: Local
Facility Representative(s) / Title / Contact Info: Ms. Heather Palmer / Senior Safety, Health, Env Manager Ms. Tyler Kirkland / Safety, Health, Env Engineer Mr. Alan Cook / Operations Engineer, WWTP Class A	Other Facility Data / Permits Held: FRS ID: 110000587525 Industrial Stormwater: SCR004189 Water Use: 45IN001G NCCW: SC0003123 Class 2 Landfill: 453349-1601 RCRA LQG: SCD083418491 CAA Major: SC0002320-0001	
Facility Responsible Official / Contact Info: Ms. Heather Palmer / Senior Safety, Health, Env Manager (843) 382-6005 Heather.Palmer@dsm.com	Additional Inspectors / Agency / Department: Ms. Lori Baxley / SCDHEC / Columbia Mr. Danny Nicholas / SCHDEC / Columbia Ms. Shauna Stevens / SCDHEC / Myrtle Beach	

SECTION C: Areas Evaluated

☒	Permit	☒	Potential for Discharge	☒	Regulated Processes	☒	Industrial Pretreatment System
☒	Record keeping Compliance	☒	Self-monitoring Compliance	☒	Self-reporting Compliance	☐	Municipal Sewage Treatment System
☒	Slug Discharge Controls	☒	Monitoring Data	☒	Self-Monitoring Equipment	☐	Solids Handling/Disposal
☐	Compliance with Enforcement	☐	Other: -				

SECTION D: Summary of Findings / Comments

See attached Section D.

Lead Inspector Digital Signature: DAVID PHILLIPS Digitally signed by DAVID PHILLIPS Date: 2023.06.02 17:25:31 -04'00'	ECAD Unit / Phone Number / E-mail WEB/WES – (404) 562-9773 – phillips.david@epa.gov
Supervisor Digital Signature: Sayre, Dennis Digitally signed by Sayre, Dennis Date: 2023.06.06 13:26:01 -04'00'	ECAD Unit / Phone Number / E-mail WEB/WES – (404) 562-9756 – sayre.dennis@epa.gov

United States Environmental Protection Agency Region 4
Clean Water Act – Wastewater Field Report
PT – DSM – 022322 (Continued)

Section D: Summary of Findings / Recommendations

On 2/23/2022, the EPA and representatives of the South Carolina Department of Health and Environmental Control (SCDHEC) conducted an unannounced Industrial User Inspection of the DSM Nutritional Products, LLC (DSM) facility located at 1416 North Williamsburg County Highway in Kingstree, South Carolina. EPA's Enforcement and Compliance History Online system did not indicate that DSM held any state environmental permits. However, SCDHEC has verified that DSM holds several permits (noted in Section B above) for a Class 2 landfill operation, industrial stormwater control, water use, and air pollution control. The facility is also a RCRA large quantity generator.

DSM also holds a Significant Industrial User (SIU) permit for the discharge of industrial wastewater into a publicly owned treatment works (POTW), which is issued by the nearby Town of Kingstree (Town) under a local pretreatment program authorized by SCDHEC pursuant to 40 CFR Part 403. The latest SIU permit application certified on 10/26/2020 by Mr. Daan Verkoeijen, the DSM Site Director, denoted that processes at DSM involve fermentation to grow strains of algae and fungi that are further processed in batches to recover oils, which are marketed as food supplements.

The inspectors presented credentials and conducted an opening conference with Heather Palmer (DSM Safety, Health, and Environmental Manager), Tyler Kirkland (DSM Engineer), and Alan Cook (DSM Operations Engineer). An interview was conducted, and selected records were reviewed onsite. In the interest of time, monitoring data and other records were requested to be sent for further review after the inspection.

The developed portion of the DSM property spans many acres; the available time and pandemic considerations precluded an inspection of the production areas. However, inspections of the pretreatment system and the effluent discharge point were performed with the assistance of Mr. Cook. Preliminary findings were shared with the DSM representatives in a closing meeting, which was held briefly given the late hour. This report presents the final inspection observations and findings following a review of the supplemental information submitted by DSM.

1. Background. Based on the property record, FermPro Manufacturing, LP (FermPro) began operating a contract-based fermentation service onsite in 1994. FermPro also began collecting surrounding properties to eventually form a 500-acre site, and constructed fermentation, laboratory, warehousing, and other structures onsite. In 2003, FermPro was acquired by Martek Biosciences Corporation (Martek). In 2011, Martek was acquired by Royal DSM, the corporate parent of DSM. Since the acquisition, DSM has magnified production of particular food supplement products that FermPro had first begun producing in 2002 under its final contract with Martek.

Although the DSM facility is located in unincorporated Williamsburg County, SCDHEC has authorized the Town as the area's pretreatment program control authority. The Town's main sanitary sewage treatment facility is located at 100 Nelson Boulevard (NPDES Permit SC0035971), which is about a 7.5-mile drive from DSM. All of the non-domestic wastewater discharged by DSM enters the POTW system owned and operated by the Town.

The Town and SCDHEC have been evaluating an untenable chlorine demand at the POTW that dates back to 5/2016. An interference with sanitary sewage treatment has been contributing to the unusual chlorine demand and resulting in ongoing violations of the POTW's effluent limits. After a SCDHEC-required upgrade in 11/2018 that

doubled the chlorine feed capacity to 600 pounds per day, the POTW has been capable of delivering 10 mg/L of chlorine at its 3.5 million gallons per day (MGD) design flow.

However, the total influent loading at the POTW has continued to exert a chlorine demand that is more than triple this upgraded capacity. The POTW attributes the treatment interference to the volume and character of the pretreated industrial wastewater discharge by DSM, ascertaining that its discharge retains a chlorine demand in excess of 200 mg/L. While its effluent violations have continued, the POTW has sought SCDHEC approval to construct a second expansion of the chlorine storage and delivery systems at its sanitary sewage treatment facility.

2. Interview. Mr. Cook, DSM's Operations Engineer, shared that the facility uses and stores bulk commodities such as hexane, corn syrup, sulfuric acid, anhydrous ammonia, phosphoric acid, and a non-quatenary caustic cleaner. He noted the wastewaters sent to the DSM pretreatment system principally contain cleaning agents and the fermentation byproducts remaining after the hexane solvent used to extract their products is recovered.

Mr. Cook noted the bulk hexane is stored at a tank farm onsite and circulated in a closed-loop pipe system to and from the extraction process equipment. This system has been in use by the series of site owners since approximately 2001.

The bulk sulfuric acid, phosphoric acid, caustic cleaner, and corn syrup are capable of being bypassed to the pretreatment system, and thereby bypassed to the POTW. DSM had attached a Slug Discharge Control Plan to its 10/2020 discharge permit application that was sent to the Town. A copy was supplied after the inspection for review.

3. Permits and Monitoring Analyses. After identifying interference with sanitary sewage treatment in 5/2016, the Town has elected to continue accepting industrial flows from both of its permitted SIUs including DSM. The Town reissued discharge permits to DSM on: 12/29/14 (effective 1/1/15-12/31/16), 1/31/17 (effective 2/1/17-12/31/20), and 12/31/20 (effective 1/1/21-12/31/25).

DSM could not immediately produce an executed copy of the current (12/31/20) SIU permit that was signed by the Town. During the course of the inspection, Mr. Cook obtained a signature page from the Town, and afterward requested another full copy that the Town signed on 2/25/22, which had no material changes from the 12/31/20 issuance.

a. Flow. The series of SIU permits issued by the Town to DSM have not reflected any reduction to the allowable flow, which is an action that might reduce the relative impact of the non-domestic discharge on the POTW influent. The daily maximum and monthly average flow limits have remained 1,900,000 gallons/day (1.9 MGD) and 1,750,000 gallons/day (1.75 MGD) respectively.

DSM's effluent flow data reported between 1/2016 and 1/2022 was requested and reviewed. The DSM industrial discharge exerts a significant influence on the POTW's sanitary sewage treatment system. The monthly average flow from DSM has ranged between 0.34 MGD and 3.3 MGD, with a median of 0.73 MGD. Comparing recent flow information from both DSM and the POTW, the industrial discharge from DSM represents between 30% to 60% of the POTW's daily flow, with the median contribution of 45%. This proportion of non-domestic loading from a single industrial user is greater than what many municipalities receive from the sum of their industrial users.

b. Renewed Permit Changes. A new surcharge for excess chlorine demand was added to the current (12/31/20) SIU permit, allowing the POTW to obtain additional revenue for a chlorine demand exceeding 12 mg/L. The

current SIU permit requires DSM to conduct a study of the POTW's chlorine demand that might result in a modification to that surcharge structure.

The Town also increased the allowable mass loadings of both total suspended solids (TSS) (from 3,649 to 3,962 lbs/day), ammonia nitrogen (daily maximum, from 219 to 238 lbs/day; monthly average, from 146 to 158 lbs/day), and total cyanide (daily maximum from 0.15 to 0.21 lbs/day). The current permit also added several new parameters to be monitored without discharge limitations: free cyanide, conductivity, total dissolved solids, chlorides, sulfides, phosphates, sodium, calcium, potassium, and color. This current permit also marked the first instances of monthly average limits for total cyanide (0.013 mg/L and 0.190 lbs/day), and daily maximum limitations for oil and grease (25 mg/L and 396 lbs/day).

c. Self-monitoring Analyses. The series of SIU permits issued by the Town have required that DSM use a state-certified lab for analysis of its SIU permit self-monitoring samples (section II.10 of SIU permits), some of which are collected weekly. DSM refers to these samples as "external analyses" because they are sent to an outside state-certified lab for analysis, rather than its uncertified internal lab located onsite.

As part of its process controls, DSM also collects additional composite and grab samples at the permitted sampling point. This data is collected daily rather than weekly; it includes ammonia nitrogen, TSS, and COD concentrations, as well as mass loadings for COD and TSS. The Town has added an exception into the current SIU permit allowing the use of DSM's non-certified lab results for conductivity and color (monitoring only).

The SIU permits have also required that any additional monitoring performed by DSM at the sampling point using "approved analytical methods as specified by [the permits]" must be included in the compliance calculations and reporting (Section II.12 of SIU permits).

DSM has been calculating and reporting compliance with the daily maximum and monthly average ammonia-nitrogen, TSS, and COD limits in its SIU permits only using the samples that it sends out for analysis by a contracted lab. Although the analytical methods could be the same as those used in these "external analyses," which is the term DSM uses for their contracted samples, the additional daily results from the process control samples that DSM collects at the effluent pit and analyzes at its onsite non-certified lab are not being included.

The daily pretreatment process control data collected by DSM between 1/1/2016 and 2/22/2022 was requested and reviewed. The external analyses reported to the Town for SIU permit compliance between 1/2016 and 1/2022 were also requested and reviewed. EPA's comparison between the two data sets found a significant difference between the compliance values that DSM reported for compliance and the same values if the daily process control data were also accounted. The differences were particularly remarkable for mass loadings. Figures 1 and 2 present the comparison for COD.

Paired data, representing the days that both the external analysis samples and process control samples were collected from the effluent pit, were also evaluated. Statistical analysis of the COD data showed positive covariances and correlations. On over half (52%) of those concurrent sampling days, the process control sampling result (unreported) exceeded the external analysis result (reported). In that subset, the COD concentrations reported to the POTW were up to 45% less than the unreported process control sampling result, and the COD mass loadings reported to the POTW were up to 57% less than the unreported process sampling result.

d. Conventional Pollutants. The series of SIU permits issued by the Town have not reflected any reduction to the allowable oxygen demand from DSM, which is an action that might reduce the influent strength seen at the POTW. The limits for 5-day biological oxygen demand (BOD₅) have remained 200 mg/L and 2,919 lbs/day for both the

daily maximum and monthly average. The limits for chemical oxygen demand (COD) have also remained unchanged: 800 mg/L and 11,682 lbs/day for both the daily maximum and monthly average. The SIU permits issued by the Town have included a billing option allowing the POTW to obtain revenue for excess BOD₅ (surcharge fees).

The range of BOD₅ in the pretreated effluent is comparable to domestic sewage. The ammonia nitrogen, TSS, oil and grease, pH, and temperature of the pretreated effluent suggest levels compatible with the POTW's sewage treatment system.

BOD₅ reported for the pretreated effluent has a daily average concentration approaching 18 mg/L and a daily average loading approaching 110 lbs/day. However, the daily BOD₅ loading often varies significantly around this average (Figure 3). Ordinarily, where industrial flow is a smaller percentage of sewage treatment influent, this variability from individual industrial users does not have a remarkable influence. Since the DSM discharge is a large proportion of this POTW's influent flow, between 30 and 60% as noted above, the highly variable BOD₅ loading elevates the risk of intermittent operational interference at the receiving POTW.

COD reported for the pretreated effluent has an average daily concentration approaching 360 mg/L and an average loading approaching 2,200 lbs/day. The COD loading from DSM is an industrial strength, generally ranging 1,000 - 3,000 lbs/day prior to the year 2021 and 1,500 - 4,500 lbs/day thereafter. The variability of the daily COD load is greater than the BOD₅ load (Figure 4), presenting a similar risk of operational interference at the receiving POTW.

e. BOD₅/COD Ratio. A BOD₅/COD ratio greater 0.30 is optimal, signifying an influent to the POTW that is amenable to municipal sewage treatment. DSM's pretreated effluent routinely has a BOD₅/COD ratio less than 0.13, ranging most often between 0.02 and 0.06 (Figure 5). The permit limits issued by the Town to DSM have represented a ratio of 0.25.

f. Nutrient Loading. Because the pretreated effluent is a large component of the receiving POTW's influent flow, the nutrient supply present in this industrial discharge also warranted examination. Industrial discharges are often nutrient deficient. Maintaining a COD:N:P ratio approaching 150:5:1 in a pretreated effluent is optimal when it comprises a significant portion of a POTW influent.

The series of SIU permits issued by the Town have not required monitoring for total nitrogen or phosphorous, but these nutrients are necessary for biological growth and reproduction at the receiving sewage treatment system. As part of its process control sampling activities, DSM began periodically monitoring the pretreated effluent for total nitrogen (i.e., TKN + NO₂/NO₃-N) and phosphorous in 1/2020. This data was reviewed after the site inspection; the COD:N:P ratio of the discharge ranges between 347:15:1 and 8:1:1, with a median of 21:1:1.

Figure 1. DSM - Comparison of Process Control and Reported Values - COD (mg/L)

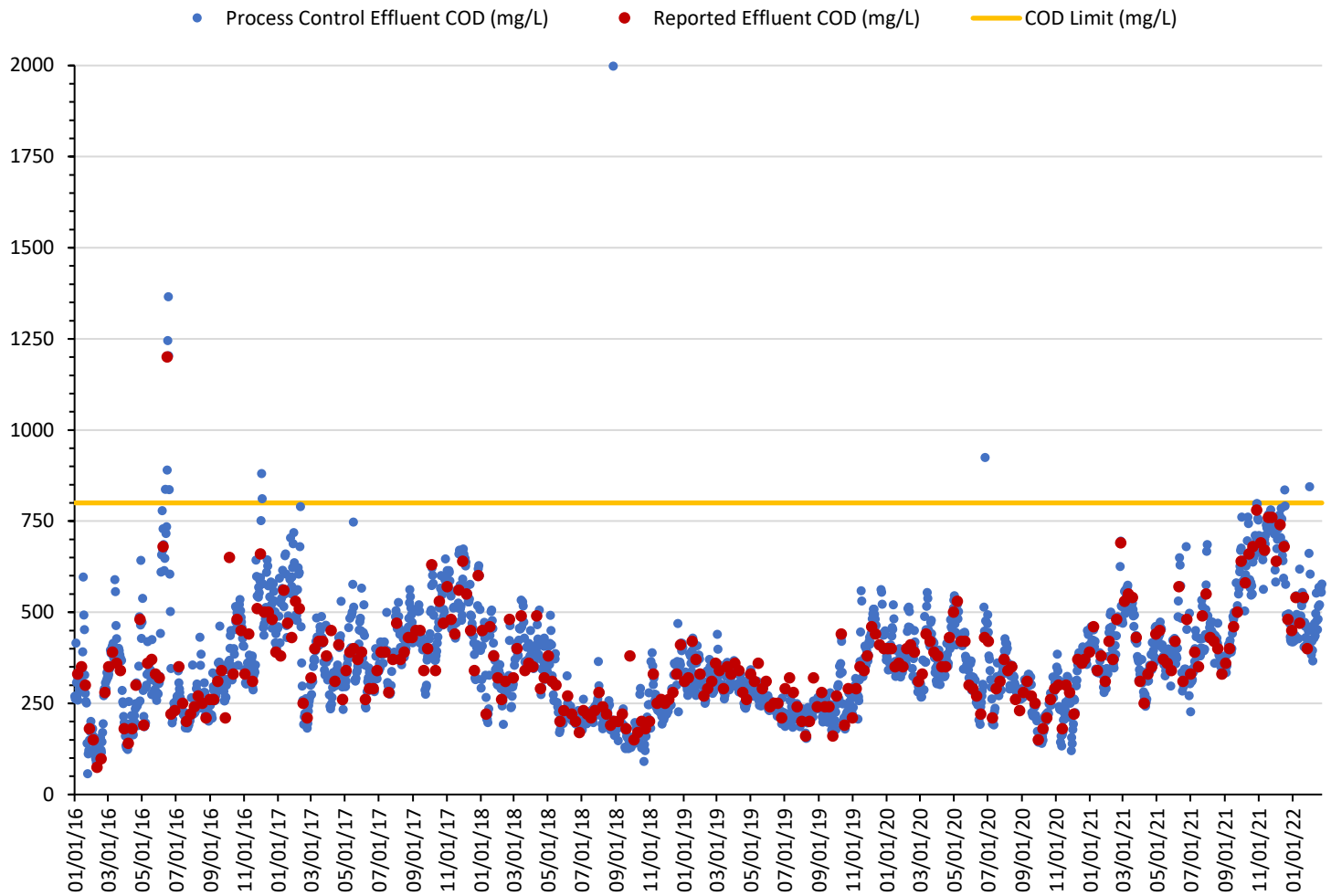


Figure 2. DSM - Comparison of Process Control and Reported Values - COD (lbs/day)

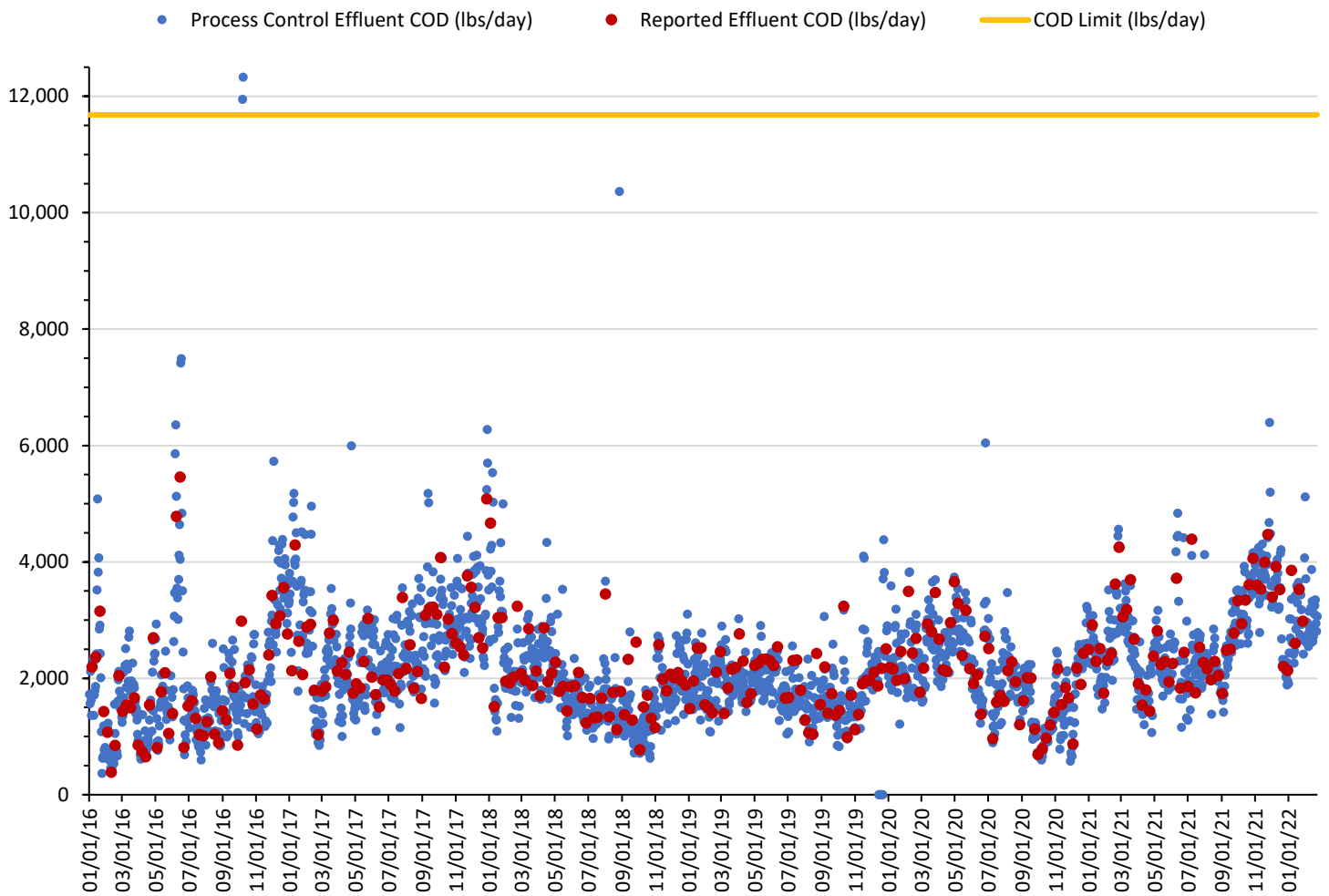


Figure 3. DSM Reported BOD₅ (lbs/day)

$R^2 = 0.0656$

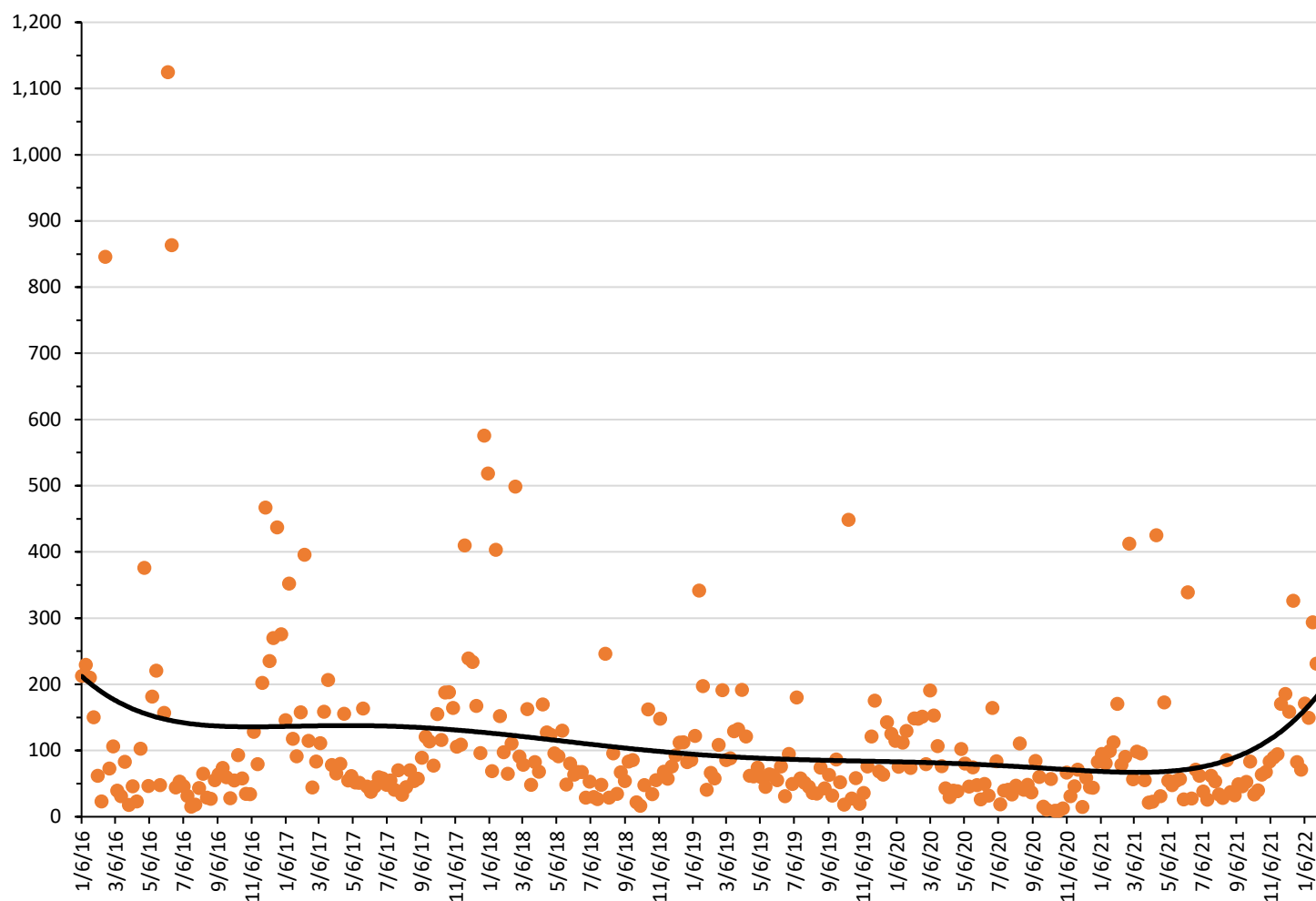


Figure 4. DSM Reported COD (lbs/day)

$R^2 = 0.2$

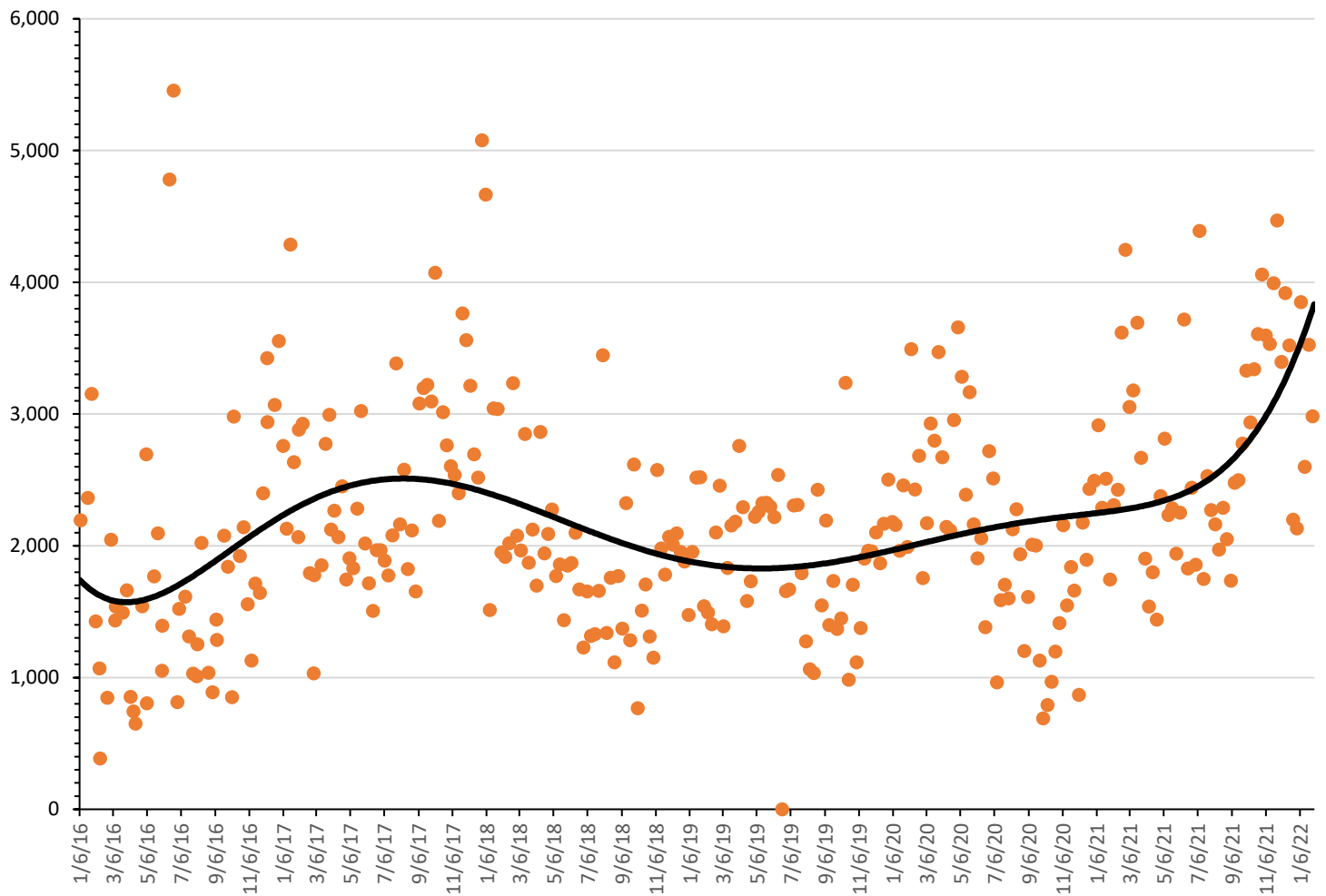
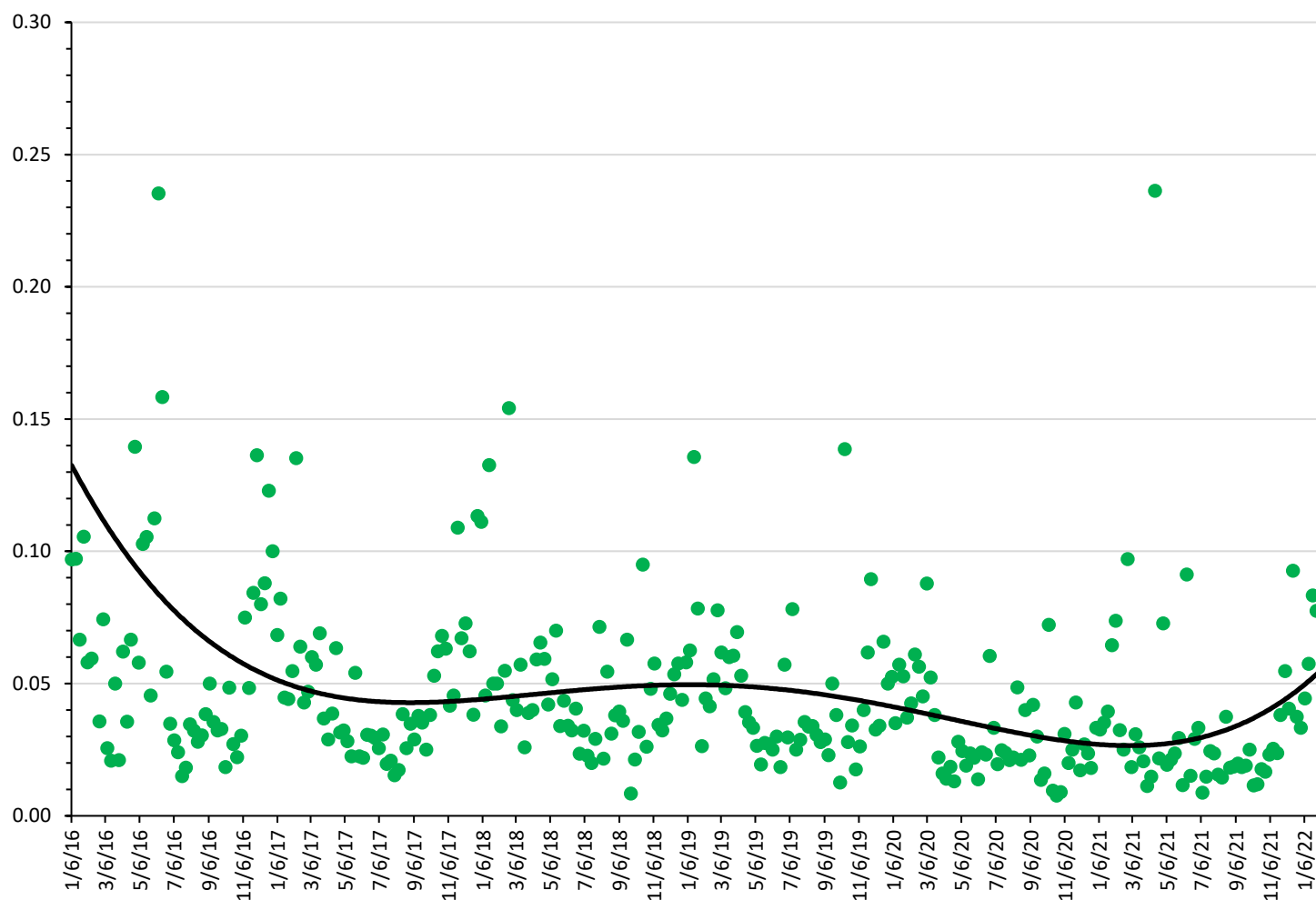


Figure 5. DSM - BOD₅/COD of Pretreated Effluent

R² = 0.0999



e. Categorical Pollutants. The series of SIU permits issued by the Town identify DSM as a categorical user subject to Pretreatment Standards for Existing Sources in 40 CFR Part 439, Pharmaceutical Manufacturing, Subpart A – Fermentation (40 CFR § 439.16). Changes have occurred at the facility since construction began in 1994, and particularly since 2002, that may have rendered applicability of new source standards, as well as additional standards in Subpart B – Extraction. A perpetuation of the 439.16 standards in the SIU permits suggests that the Town may not have accounted for such changes.

The SIU permits have required the categorical pollutants to be monitored twice a year, which is the minimum allowable frequency. All of the SIU permits issued by the Town to DSM have excluded the limitations for one categorical pollutant, methyl cellosolve.

DSM's mass loadings reported for the pretreated effluent between 1/2016 and 1/2022 were reviewed and compared against the categorical limits applied in the series of SIU permits (i.e., those based on 40 CFR § 439.16 and locally adjusted). The self-monitoring results demonstrated compliance, with one exception involving the secondary amines: diethylamine and triethylamine. Values reported for these two parameters are also consistently the same, suggesting a non-specific method of analysis might be in use instead of EPA Method 1666. The SIU permits issued by the Town have not specified the analytical method to use for each parameter.

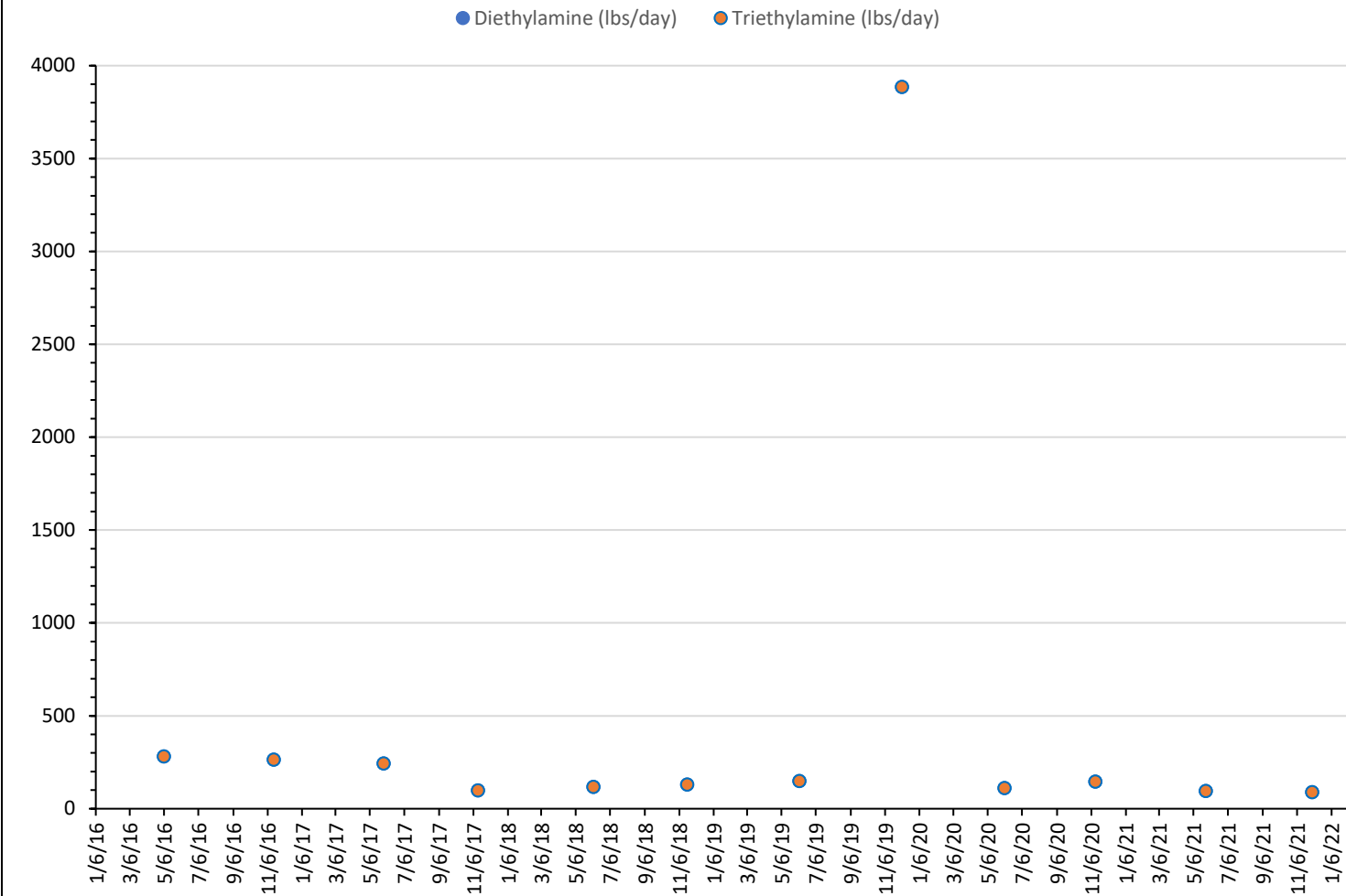
The secondary amines in the 12/2019 sampling by DSM significantly exceeded all eight of the SIU permit limits for both concentration and mass (Figure 6). The enforcement record reported to SCDHEC (Table 1, below) indicates these categorical violations were not identified, reported, and addressed by either DSM or the Town, or that the Town identified and provided public notice of DSM being in Significant Non-Compliance with pretreatment standards.

4. Enforcement History. Mr. Cook supplied a Notice of Violation (NOV) recently received from the Town on 2/1/2022 because DSM had collected only one free cyanide sample in 2021 instead of twice per month as required by the SIU permit. Mr. Cook supplied the response from DSM dated 2/9/2022, which discussed mishandling of its 12/2021 samples, but did not explain why samples were not reported for the prior 11 months.

Mr. Cook noted that the Town had expressed concern with the presence of cyanide in the DSM discharge. DSM's reported analyses for total cyanide since 2016 indicate a maximum concentration of 0.015 mg/L in 4/2019, and a maximum loading of 0.692 lbs/day in 6/2018. DSM's reported analyses for free cyanide since monitoring began in 2021 indicate a maximum concentration and loading in 5/2021 of 0.24 mg/L and 1.52 lbs/day, respectively.

Since the facility doesn't use cyanide as a bulk reagent, DSM had conducted a bench scale study to determine its source. DSM's investigation found that ferric cyanate was present in small quantities as an anti-caking agent in a salt that is used within the Extraction processes. DSM has worked with their supplier to formulate and order a replacement salt without the ferric cyanate; however, it was not yet in use at the time of this inspection. DSM has been joining monthly meetings with the POTW and its consultants.

Figure 6. DSM Reported Diethylamine and Triethylamine (lbs/day)



DSM has also reported exceedances of TSS and COD limits on a number of occasions in the past. DSM received a NOV in 6/2016 for discharging 1,200 mg/L COD (900 mg/L limit). Process loadings on the pretreatment system had resulted in insufficient dissolved oxygen and a spike in COD for three days. DSM received a second NOV in 8/2018 for exceeding COD and TSS due to an unauthorized discharge from its fermentation processes. At the time, the Town asserted those discharges contributed to an effluent violation of its pH limit.

In 3/2020, DSM self-reported solids carrying over the pretreatment system's clarifier weir for about six hours, which resulted in a discharge containing 355 mg/L TSS (250 mg/L limit). In 6/2020, DSM also self-reported exceeding both COD concentration and mass limits, suspecting it was due to a (slug) loading from its clarifier cleaning activities. The Town did not issue notices of violation for those exceedances.

Under 40 CFR § 403.12(i) and analogous SCDHEC requirements, the POTW routinely submits certified reports of its oversight activities and the industrial user compliance associated with its authorized pretreatment program. The POTW's reporting to SCDHEC concerning DSM for the previous three years is summarized in Table 1 below.

Table 1. Kingstree Semi-Annual Pretreatment Program Reporting on DSM

<i>Reporting Period</i>	<i># Violations</i>	<i># NOV Issued</i>	<i># Orders Issued</i>	<i>Penalties</i>	<i># SNC Notices</i>
7/1/2021-12/31/2021	4 ^a	2 ^a	0	\$0	1 (CN-free)
1/1/2021 – 6/30/2021 ^b	1	1	0	\$0	0
7/1/2020 – 12/31/2020	3 ^c	0	0	\$0	0
1/1/2020 – 6/30/2020 ^d	0	0	0	\$0	0
7/1/2019-12/31/2019	1 ^e	0	0	\$0	0
1/1/2019 – 6/30/2019	1 ^e	0	0	\$0	0

^a Chronic failure to self-monitor free cyanide even after SNC notice, and a total cyanide limit exceedance.

^b Kingstree POTW reported a free cyanide limit exceedance in 5/2021. Details of DSM NOV unreported.

^c NOVs for a failure to self-report ammonia-N, and total cyanide exceedances in 10/2020 and 11/2020. (daily max). Kingstree POTW reported an e-coli limit exceedance.

^d Kingstree POTW reported an e-coli exceedance occurring in 4/2020.

^e DSM total cyanide exceedances in 4/2019 and 10/2019.

5. Facility Site Review

a. Operations and Storage. Inspections of these areas were omitted due to the available time and the size of the facility.

b. Pretreatment System. The latest (10/2020) SIU permit application from DSM cited that it employs four operators for the pretreatment system that are licensed by South Carolina for biological wastewater treatment (one Level A, one Level B, and two Level C). Mr. Cook, the Operations Engineer, is one of these operators, and is also licensed for physical-chemical wastewater treatment (Level A).

The application described the pretreatment system as including influent equalization, aerobic digestion, activated sludge biological treatment with secondary clarification, and intermittent use of a dissolved air floatation system. The application notes that hazardous waste is not managed using the pretreatment system. Solids produced by the pretreatment system were stated to be processed into compost, landfilled on-site, or incinerated/recycled.

DSM representatives accompanied the inspectors on a tour of the pretreatment system. Mr. Cook noted the pretreatment system begins with an influent pit that collects wastewater originating from several production areas: the West Plant, Phase 1 and Phase 2 Fermentation, Spray Drying, and Extraction. The flow from the influent pit is collected by the influent equalization basin (1 million gallon capacity), which is operated anoxically using up to four 40 horsepower aerators. Mr. Cook noted these aerators are in operation nearly 24 hours a day, and inspectors observed all four aerators were in operation at the time. The collected influent has a red clay color.

The influent flow and return waste sludge in the influent equalization basin can be diverted by gravity to the dissolved air floatation (DAF) unit or to the aeration basin (3 million gallon capacity). Mr. Cook noted that the DAF unit is primarily used on an intermittent basis for the facility's extraction process wastewater, which at times has a higher COD than other contributions, but it may be used in other instances of elevated COD. The Extraction wastewater is able to be sent directly to the DAF or to the equalization basin. Inspectors observed a single DAF unit, which appeared to receive a high loading.

Mr. Cook noted there are no chemical additions to the aeration basin to facilitate biological treatment. Mixing is provided by up to five 75 horsepower and five 70 horsepower aerators. A cellular surfactant is added between the equalization and aeration basins. The ten aerators in the aeration basin are operated on a cycle to deliver dissolved oxygen up to 2 mg/L. Inspectors observed eight of the ten aerators operating.

The aeration basin discharges to two parallel clarifiers (90,000 gallon and 130,000 gallon capacities). The former is a refurbished clarifier with an 8-foot depth, and the latter is a newer installation with a 12-foot depth. Mr. Cook noted that it is difficult to maintain a 2- to 3-foot blanket in the 90,000 gallon clarifier but that is more easily maintained in the 130,000 gallon clarifier, which is valved to receive about 70% of the flow. Inspectors observed that both clarifier overflows have a dark red-brown color similar to the process influent. Floatable solids were not observed.

Mr. Cook noted that settled solids are being processed using a screw press before they are applied locally as a soil amendment. If poor settling is encountered, DSM employs up to three different polymers for use in the DAF unit, screw press, and clarifiers. Also, three coagulants are selectively applied to the splitter box and the DAF unit.

The Safety Data Sheets for the polymers and coagulants were requested and reviewed. The polymers being used are biodegradable, and at pH > 6 they require 28 days to hydrolyze by 70%. The coagulant applied to the splitter box and DAF unit is 40% aluminum chlorohydrate, which has a bacterial EC₅₀ > 1000 mg/L. A second coagulant applied to the DAF unit is a 50% dimethylamine, epichlorohydrin, ethylenediamine polymer, which is not biodegradable and can exhibit ecotoxicity (Daphnia EC₅₀ - 48 hours at 10-100 mg/L). A third coagulant applied to the DAF unit is used to significantly reduce nutrient loading (e.g., phosphorous), and can exhibit ecotoxicity (Ceriodaphnia NOEC - 6 days at 2.5 mg/L).

Inspectors observed two elevated totes of coagulants placed between the clarifiers and the effluent flume on a stand with shallow pans for spill containment and without a cover. The limited storage availed by the pans had been displaced by a volume of collected rainwater.

Inspectors next observed the effluent and flow monitoring area adjacent to the clarifiers. The effluent sampling unit is an ISCO model 5800. The digital temperature reading on it was 9.8 degrees Celsius, and the sample closet did not contain an accuracy-certified thermometer for secondary verification. Mr. Cook was advised that one was needed. The digital readout at the time of inspection was displaying a warning to replace the sample tubing, which inspectors observed to be in poor condition and containing standing material such as solids or biological growth. The sampler at the time of inspection was actively collecting a composite using 90 mL aliquots.

Effluent flow is measured using a doppler device over a flume covered by a grate. Inspectors observed that the flume discharge at 5:27 PM had a shallow laminar flow, and the same color as what was observed in the clarifiers nearby. The effluent pump in use was observed to have seal leaks.

6. Findings & Recommendations

- a. **Finding:** Per 40 CFR § 403.8(f)(2)(vi), a slug discharge is 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 of the POTW, or in any other way violate the POTW's regulations, local limits or permit conditions. DSM has a Slug Discharge Control Plan that appears to have been carried forward from the prior Martek ownership period, with a few non-material edits that were made in 2012 and 2018. DSM's SIU permit (Section IV.9) requires that the Plan be updated as necessary. The current Plan includes several of the minimum requirements from 40 CFR § 403.8(f)(2)(vi), but not all of them. Additional findings:

- (1) The plan is very generalized; DSM and other first responders will benefit from including a more detailed and systematic evaluation of spill/discharge risks and the preventive and operational response protocols associated with its defined process areas (e.g., Fermentation, Extraction) and slug control systems (e.g., the equalization basin);
- (2) The multiple slug discharge events in 6/2016, 8/2018, 3/2020, and 6/2020 that resulted in NOVs from the POTW should have prompted material updates to the Plan, but those are not reflected in its update history;
- (3) The Plan only focuses on preventing upset of the DSM pretreatment system. Pursuant to 40 CFR § 403.3(s), pretreatment includes control equipment, such as equalization tanks or facilities, for protection against surges or slug loadings that might interfere with or otherwise be incompatible with the POTW. Some slug loads occurring to the POTW, including flow volume itself, might pass through the DSM pretreatment system unidentified by the periodic self-monitoring, or enter the public sewer from another route onsite that hasn't yet been evaluated. Those types of risks and necessary preventive assets should also be identified and addressed in the Plan; and,
- (4) The Plan lacks a current description of the stored chemicals onsite (required by § 403.8(f)(2)(vi)(B)), lacks protocols for different types of slug discharge scenarios, and lacks specificity in preventive protocols and actions (required by § 403.8(f)(2)(vi)(D)).

Recommendations: DSM should immediately proceed with updating the current Slug Discharge Control Plan and necessary control equipment to address the noted deficiencies, rather than waiting until the next permit renewal period. Section 2 of EPA's guidance may be helpful in developing a more utilitarian Plan: EPA 21-W4001 – [Control of Slug Loadings to POTWs](#) (February 1991).

- b. **Finding:** DSM did not possess a copy of its current (12/31/20) SIU permit that had been fully executed by the POTW. Pursuant to 40 CFR § 403.8(f)(1)(iii), DSM is required to hold a valid SIU permit.

Recommendation: Although DSM was able to obtain a signature page during the inspection, and a fully executed copy that the POTW had signed on 2/25/22, which was over a year after the effective date. The Town and DSM need to ensure each party receives a complete and fully executed copy of the SIU permit on the date of the reissuance or modification.

- c. **Finding:** The discharge from DSM strongly influences the municipal treatment facility, representing a median contribution of 45% of its daily flow. The variability of the BOD₅ and COD loadings, which is typical of an industrial user, therefore has an outsized effect on the receiving municipal treatment climate, elevating the risks of operational interference at the POTW.

Recommendation: Additional pretreatment and/or effluent equalization to normalize DSM's daily conventional pollutant loadings will help to reduce the risks of interference with the POTW.

- d. **Finding:** The BOD₅/COD ratio of an industrial effluent can predict the capability of the POTW's biological treatment system to manage the non-domestic loading. A ratio of 0.60 or higher offers assurance the industrial effluent is fully compatible with a POTW and amenable to its biological treatment. A ratio less than 0.30 suggests the effluent will be highly problematic for a typical municipal biological system designed to treat domestic sanitary sewage.

The BOD₅/COD ratio of DSM's pretreated effluent has been consistently suboptimal, ranging most often between 0.02 and 0.06. This is largely due to the margin between the more compatible BOD₅ loading and the more industrialized COD loading in the effluent resulting from the currently available pretreatment system.

Recommendations: Improving the daily BOD₅/COD ratio of the DSM effluent through additional pretreatment will yield greater compatibility with the Town's sanitary sewage treatment system and potentially resolve the chronic interference that it has been experiencing. DSM and the Town may also need to discuss the BOD₅ and COD permit limits; the current permit limits represent a BOD₅/COD ratio of 0.25, which is also suboptimal.

- e. **Finding:** An evaluation of the available process control data from DSM indicates the pretreated effluent has a median COD:N:P ratio of 21:1:1. This suggests the discharge, which comprises a median 45% of the POTW influent, is delivering a suboptimal nutrient supply for the POTW.

Recommendation: Maintaining a COD:N:P ratio in the pretreated effluent approaching 150:5:1 will yield greater compatibility with the Town's receiving sanitary sewage treatment system and potentially resolve the chronic interference that it has been experiencing. Bulk chemical additions and using operational levers such as return sludge streams are methods often used together to optimize the nutrient supply in industrial effluents.

- f. **Finding:** The permits issued by the Town to DSM do not specify the 40 CFR Part 136 methods to be used for analyses of the limited pollutants, but Section II.10 of the permits do require DSM to use Part 136 methods that are sufficiently sensitive to evaluate compliance with the pretreatment standards in the SIU permit.

Recommendation: Specifying the analytical methods to be used for each pollutant parameter in the limitations table of the SIU permit would assure that both DSM and the Town are using the same analytical methods for their compliance monitoring and compliance oversight activities, respectively, and could prevent any future confusion about which method is sufficiently sensitive for monitoring the SIU permit limits.

- g. **Finding:** The SIU permits for DSM have required that 40 CFR Part 136 analytical methods be used for all analyses, and that a state-certified lab be used for all analyses (Section II.10). The SIU permits have also required (Section II.12) that the results of effluent samples collected more frequently than the minimum permitted frequencies be reported if the analytical methods specified in the permit are used (i.e., sufficiently sensitive methods in 40 CFR Part 136, per Section II.10). The Town has added an exception into the current SIU permit for conductivity and color, allowing DSM to submit results for those from a non-certified lab.

Since at least 2016, DSM has been using a state-certified lab to analyze the ammonia-nitrogen, TSS, and COD samples collected at the effluent monitoring point that it reports to the POTW. However, on a daily basis, DSM also collects and analyzes additional samples for these pollutants at the effluent monitoring point as part of its process controls. Since these process control samples are not analyzed at a state-certified lab, DSM has not been reporting their results to the POTW.

Use of a state-certified lab for all analyses submitted to the POTW does not appear to be incorporated into the EPA-authorized pretreatment program for SCDHEC, or into the SCDHEC-authorized pretreatment program for the POTW. Federal (40 CFR 403.12(g)(5)-(6)) and corresponding South Carolina regulations (R.61) only require that effluent samples be reported to the POTW if they are collected and analyzed using 40 CFR Part 136 methods, or other EPA-authorized methods where the promulgated methods are inappropriate.

If process control samples for ammonia-nitrogen, TSS, and COD are being collected at the permitted effluent monitoring point and analyzed using 40 CFR Part 136 methods, then DSM may not have been reporting all of the monitoring data as required by 40 CFR § 403.12(g)(6). EPA also identified differing compliance outcomes, whereby the reported results from a certified lab were significantly less than the unreported process control results collected on the same day by DSM. EPA's analysis of the DSM process control and reported datasets suggest there could be unaccounted and unaddressed effluent non-compliance.

Recommendations: The methods used to collect and analyze the process control samples for ammonia-nitrogen, TSS, and COD need to be evaluated for compliance with 40 CFR Part 136 and the results of that evaluation reported to EPA. If the process control effluent sampling is compliant with 40 CFR Part 136, then DSM needs to provide an update to the Town denoting its past monthly compliance and non-compliance reporting records and necessary changes, and copy EPA and the SCDHEC pretreatment program. The Town will need to discuss with SCDHEC how to revise its SIU permits so they will conform with the local program that SCDHEC has authorized for the Town and comply with federal and state requirements.

Finding: Cyanide, whether free or complexed, can severely inhibit biological respiration, and consequently inhibit the sewage treatment operations of a POTW as well as the settleability of its solids. Per EPA guidance, such inhibition can occur at cyanide concentrations exceeding 0.1 mg/L, and nitrification can specifically be inhibited at a cyanide concentration of 0.34 mg/L or greater.

The receiving POTW reported an NPDES exceedance of its free cyanide limit in 5/2021. The effluent results for free cyanide that DSM has reported since 2021 indicate a maximum concentration and loading occurred in 5/2021 of 0.24 mg/L and 1.52 lbs/day, respectively. The semimonthly free cyanide reported by DSM in 5/2021 and 6/2021 ranged between 0.11 and 0.24 mg/L.

The DSM contribution, which comprises a median 45% of the POTW influent, surpassed the 0.1 mg/L inhibition threshold, indicating a contribution to the free cyanide pass-through event at the POTW in 5/2021. Contributing to pass-through is prohibited by 40 CFR § 403.5(a)(1). Pretreatment program reporting by the Town suggests that it did not identify, enforce, or report the pass-through event to SCDHEC as required.

Recommendation: However possible, DSM needs to expedite its effort that began in 2018 to remove cyanide from its processes. If cyanide continues to be detected in its effluent at levels of concern after replacement of the salt reagent containing ferric cyanate, then DSM will need to investigate sources of secondary cyanide formation in production and/or pretreatment.

- h. Finding:** The Town identifies DSM as a categorical user subject to the Pretreatment Standards for Existing Sources in 40 CFR Part 439, Pharmaceutical Manufacturing, Subpart A – Fermentation (40 CFR § 439.16). Changes at the facility since 1994, and particularly since 2002, may have rendered applicability of new source standards, as well as an additional set of standards (Subpart B – Extraction).

Recommendation: Further evaluation by EPA or SCDHEC may be needed to assure the categorization by the Town is accurate. A rectification to new source status or an additional application of Subpart B would not alter the categorical limits that are presently applied in the DSM permit.

- i. Finding:** Since at least 2016, DSM has self-monitored for all of the applied categorical pollutants (40 CFR § 439.16) except for methyl cellosolve. Categorical users are required to monitor all applicable categorical standards at least semiannually (40 CFR § 403.12(e)(1)) unless the POTW elects to assume the responsibility to monitor in lieu of the user (40 CFR §§ 403.8(f)(2)(v)(A) and 403.12(g)), or a proper waiver and certification is granted and denoted in the user permit (40 CFR § 403.12(e)(2)). A monitoring assignment for methyl cellosolve or a waiver for this pollutant has been unmentioned in the applications from DSM and the user permits issued to DSM by the Town. Annual analyses confirming the absence of methyl cellosolve or its surrogate also did not appear to have been performed as required by 40 CFR § 439.4.

Recommendations: DSM must self-monitor for the categorical pollutant methyl cellosolve as required by 40 CFR §§ 403.12(e)(1) and/or 439.4. The Town needs to update the SIU permit to assign monitoring and recordkeeping requirements for that categorical pollutant.

- j. Finding:** The categorical pollutants self-monitored by DSM have remained in compliance with SIU permit limits, with one exception involving the secondary amines: diethylamine and triethylamine. Values reported for these two parameters are also consistently the same, suggesting a non-specific analysis has been used instead of the techniques in EPA Method 1666. The SIU permits issued by the Town have not specified the analytical method for each parameter but have required that appropriate 40 CFR Part 136 methods be employed.

The result reported by DSM for both secondary amines in 12/2019 significantly exceeded all eight limits applied to both concentration and mass in the SIU permit. The enforcement record reported to SCDHEC by the Town did not include these categorical violations, suggesting that neither DSM nor the Town had identified them. Consequently, the Town did not provide the public with the required 40 CFR § 403.8(f)(2)(viii) notice of significant non-compliance for these violations.

Recommendations: Pursuant to Section II.10 of the SIU permit, DSM is required to use a sufficiently sensitive analytical method in 40 CFR Part 136 that is able to detect the presence of each pollutant at or below its effluent discharge limit. DSM needs to begin using an analytical method capable of isolating each regulated amine and detecting them with a sensitivity that can be compared against the standards.

These amines are regulated because they can present ecotoxicity to the POTW. DSM should also evaluate the source of these amines in its discharge and seek their reduction by applying source reduction methods or additional pretreatment. One source of diethylamine appears to be a coagulant currently being used by DSM with the DAF unit. The Town needs to properly address the 12/2019 significant non-compliance, provide the required public notice, and update its reporting to SCDHEC.

- k. **Finding:** The DAF unit appears to be used at full capacity when operating, and according to DSM it is not being operated continually.

Recommendations: Pretreatment could benefit from one or more additional DAF units for flexibility with operations and maintenance. Increased use of DAF with the pretreatment system would also reduce the present burden on the POTW, and can help to improve the BOD₅/COD ratio of the DSM effluent. Dividing the loading placed on a single unit may increase removals and also yield some reduction to the chemical demands and those associated costs to DSM.

- l. **Finding:** The chemical coagulant storage tanks for the dewatering press were placed near the effluent point and had secondary containment with a very limited capture volume, and that volume had been displaced by rainwater. The location of the tanks also presented a potential risk of a slug discharge to the POTW.

Following the closing meeting where EPA initially raised these concerns, DSM conveyed that it implemented a procedure to shuttle these totes to and from the solids press building as needed until a more permanent solution could be reached. DSM also implemented a procedure to wash any residual material from empty totes before storing them along a fence line.

Recommendation: DSM should update EPA on its permanent solution regarding these concerns and propose modifications to its Slug Discharge Control Plan to the City to account for any physical or procedural improvements.

- m. **Finding:** Pursuant to 40 CFR §§ 403.12(g)(3) and (5), self-monitoring by DSM is required to be collected in a manner that conforms to 40 CFR Part 136 and appropriate EPA guidance. Inspectors observed several concerns with compliance monitoring practices:

- The digital temperature reading on the automatic sampling equipment was 9.8 degrees Celsius, but the sample closet did not contain a certified thermometer for secondary verification;
- The display had also been displaying a warning to replace the sample tubing, which inspectors observed to be in poor condition and contained standing solid material that appeared to be biological growth; and
- The automatic sampler was also programmed to collect a composite using 90 mL aliquots instead of at least 100 mL aliquots that are specified by EPA guidance.

Following the closing meeting where EPA initially raised these concerns, DSM conveyed that it had resampled, increased the programmed aliquot volume to 110 mL, replaced the sample tubing, and ordered a Fisher-branded thermometer to install for verifications.

Recommendation: DSM should ensure that all monitoring at the effluent point always complies with 40 CFR §§ 403.12(g)(3) and (5).

- n. **Finding:** An effluent pump in use was observed to have active seal leaks. Following the closing meeting where EPA initially raised this concern, DSM conveyed that it had investigated the status of an existing project to install aboveground pumps intended as a replacement and noted that the replacement design includes permanent spill/leak containment. The leaking pump was scheduled for repair and DSM intends to install temporary spill containment around the pumps until the new pumps can be installed.

Recommendation: DSM should update EPA and the City on the timing of the completed repair, installation of the temporary containment, and the installation of the replacement pump system.

7. Photographs

Photo-1. DSM Pretreatment - Influent Pit and Sampling Tube



Photo-2. DSM Pretreatment - Influent Equalization Basin with Aerators



Photo-3. DSM Pretreatment - Aeration Basin



Photo-4. DSM Pretreatment - Covered DAF Unit



Photo-5. DSM Pretreatment - 8-FT Clarifier Overflow



Photo-6. DSM Pretreatment - 12-FT Clarifier Overflow



Photo-7. DSM Pretreatment - Effluent Flume Discharge



Photo-8. DSM Pretreatment – Coagulant Totes Near Effluent Flume



Photo-9. DSM Pretreatment – Effluent Compositor Tube Warning



Photo-10. DSM Pretreatment – Effluent Compositor Tube (at aliquot 42 of 96)



- END OF REPORT -