Attachment 14

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Lewes, Delaware
19958

September 26, 2021

Attn: Mr. Chase Brockstedt

Re: New-Indy Catawba Mill: Preliminary Report on Causes of and Solutions for Odors

Dear Mr. Brockstedt,

This letter is a preliminary report on the cause of the reported noxious odors emitted by the New-Indy Catawba wastewater treatment plant (WWTP) since February 2021 and what can be done to immediately reduce and eventually eliminate the conditions at the WWTP that cause the malodorous and toxic emissions.

This letter report is my evaluation as an expert in wastewater treatment and residuals (sludge) handling of the wastewater treatment history, operations, and practices at the New-Indy plant and its impact on the local environment. I have formed my opinions, analyses, and conclusions with a reasonable degree of engineering probability after reviewing the references listed in the attachment. My opinions and conclusions are also based on my education, experience, and training in the environmental, engineering, and science of the treatment of pulp and paper mill wastewater, discharge of treated effluent, disposal of residual sludges and floatables, off-gas releases, and my knowledge of related regulations, standards of practice, and public health requirements.

All opinions expressed herein are based on the information received and documents currently available, with the right to supplement and/or modify the opinions as more information is discovered or becomes available.

Qualifications:
My education and my entire working career have been dedicated exclusively to wastewater and residuals treatment including treatment plant engineering and design, plant operations, treated effluent discharge, and residuals disposal and management. My Bachelor of Environmental Engineering and Master of Water Quality Engineering both came from Vanderbilt University with an emphasis on wastewater treatment.

After graduate school I worked as an Engineering Consultant evaluating wastewater treatment systems to: assess performance capability; determine reasons for failure and methods of cure; determine performance efficiency and improve treatment where possible. In 1981 I started my own Environmental Technology company and introduced new processes to the field. My 17 patents were the basis of design for over 700 WWTP's located in over 17 countries, treating many kinds of industrial wastewater, sanitary wastewater, and associated residuals.

I have personally designed and provided process and mechanical troubleshooting and problem solving for hundreds of WWTPs, including nine pulp & paper mills. I spent five years as a Vice President of Technology for two of the largest wastewater treatment companies in the world: U.S. Filter (now Evoqua), and Veolia Water. The past 19 years I have operated my own consulting firm specializing in all aspects of wastewater treatment.

Introduction
It has been well established in documents available from the South Carolina Department of Health and Environmental Control (DHEC) that the New-Indy Catawba WWTP was ineffective at sulfide removal and in a

state of poor operation most of the time since New-Indy converted the mill operation from white paper to linerboard on February 1, 2021. Since that startup, the mill and WWTP have routinely released offensive and dangerous gases to the ambient air and unfortunate downwind residents. In fact, New-Indy, DHEC, and the EPA have each documented excessive concentrations of hydrogen sulfide (H_2S). As shown below, large amounts of other associated gases with strong odors and documented toxicities also have also released to the surrounding community – and it is continuing.

Among many other documents I have reviewed is New-Indy's Corrective Action Plan (CAP), revision 2, dated July 12, 2021. The CAP describes (in New-Indy's view) the cause of this massive and sustained chemical release and the actions and upgrades required to fix the problem. While all the recommended improvements in that report are necessary, they are insufficient to fix and prevent a repeat of the odor and toxic emission problems emanating from the New-Indy WWTP that plagues the community. There remain other essential improvements and additional facilities that are necessary to eliminate the release of the malodorous and toxic emissions and to ensure they are never released to the community again. The multiple causes of this preventable failure are discussed below, followed by a discussion of the additional work required to truly fix the problem. Finally, the Appendix includes an analysis of the sulfide emissions model used by New-Indy which significantly underestimated the increase in hydrogen sulfide and total reduced sulfide emissions in its construction permit application and helped justify its request to shut down the steam stripper.

Background

New-Indy's process of turning wood into paper or linerboard (used in cardboard boxes), requires chemicals and processes that create noxious, unhealthy off-gases, and heavily contaminated wastewater. New-Indy uses the "kraft" process to digest the wood pulp, and that process uses strong sulfide chemicals that produce a liquid waste known as "foul condensate." The foul condensate contains volatile chemical compounds that have offensive odors and are toxic at elevated concentrations. The various sulfur-containing chemicals in the foul condensate are referred to as "Total Reduced Sulfides" (TRS), the most recognizable of which is hydrogen sulfide – commonly described as "the rotten-egg smell." However, there are other noxious and toxic reduced sulfur compounds in New-Indy's foul condensate, including methyl mercaptan, dimethyl sulfide, dimethyl disulfide, in addition to methanol and other volatile compounds, that are being emitted from the WWTP to the ambient air and impacting the surrounding communities. These chemicals generally have quite low odor thresholds and can be toxic at low concentrations. And while hydrogen sulfide is generally singled out for measurement, it is only an indicator of the combined TRS concentration. At New-Indy, the amount of TRS emitted to the ambient air has been estimated by New-Indy's consultants to be some ten times the hydrogen sulfide level - thus the source of odors and potential toxicity is much greater than indicated by the level of H_2S being monitored alone at the mill and in the surrounding communities.

Unfortunately, the release of excessive amounts of TRS from New-Indy's WWTP was foreseeable and could have been (and now can be) prevented but for a series of incomprehensible errors in fundamental wastewater treatment principles. New-Indy instituted a complicated conversion in the manufacturing process (from white paper to brown linerboard) and started up the new process while eliminating a critical step (steam stripping) in the TRS treatment process inside the mill. At the same time, New-Indy *also* was performing out-of-service maintenance on the critical Primary Clarifier in the WWTP which caused a radical reduction in the treatment capacity of the WWTP. Despite these mistakes, New-Indy ran the mill at or near full capacity – even *after* it lost control of the WWTP and began releasing huge amounts of offensive and dangerous off-gases which in turn caused tens of thousands of complaints from residents living as far as 30 miles from the mill.

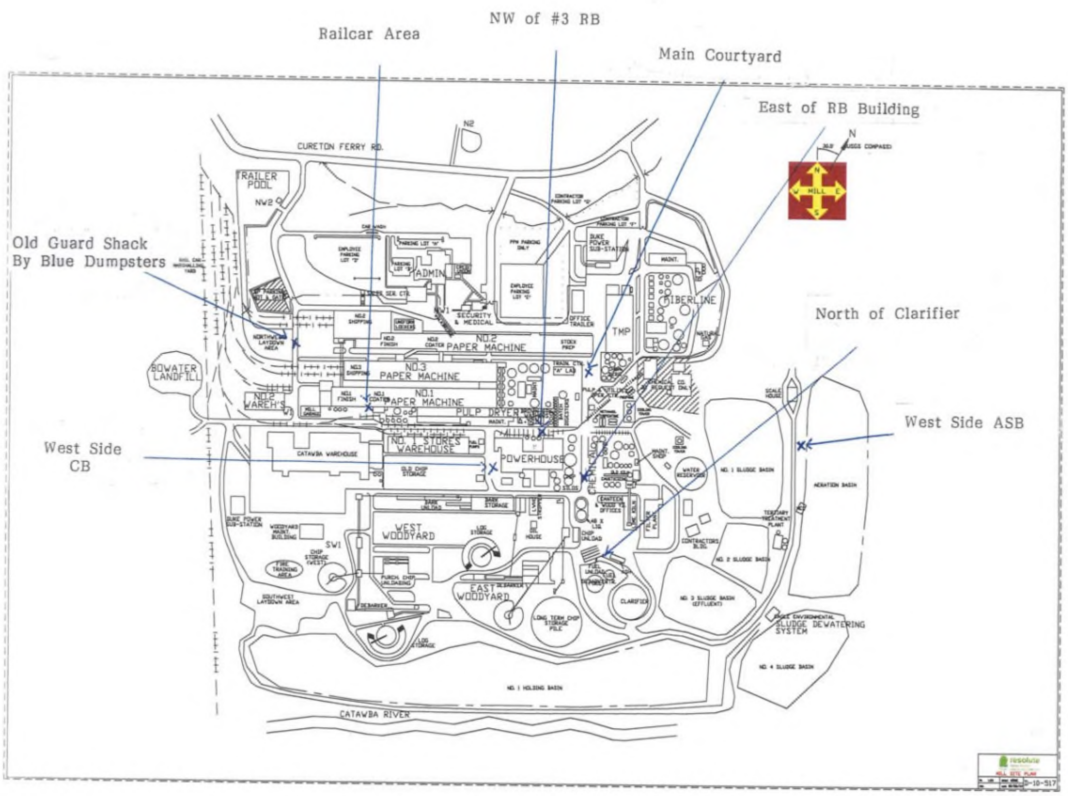
Eight months after startup of the new linerboard process, New-Indy is unable to treat all the foul condensate with steam stripping inside the mill and continues to discharge several hundred thousand gallons of the sulfideladen waste to the WWTP every day. The WWTP remains in such a poor state of operation that it continues to release TRS to the ambient air and the surrounding communities. New-Indy's failure to properly maintain the WWTP is likely causing the release of additional TRS emissions as septic solids in ponds are being removed with heavy equipment and sludge is being managed on-site. As a result, the odorous and toxic emissions continue, with residents complaining of burning eyes and throats, nosebleeds, headaches, and other symptoms. The following discusses what happened and what must be done to prevent it from happening again.

Discussion

Below, Figure 1 is an aerial view of the New-Indy property showing the mill and the wastewater treatment lagoons (picture from Google). Figure 2 is a schematic that shows the layout of the mill and the WWTP processes as seen from plan view, from New-Indy's Corrective Action Plan, Rev. 2 (CAP). According to the CAP: *"the New-Indy mill is comprised of seven (7) major operations and process areas: the woodyard, kraft pulp mill, paper machine, chemical recovery process, utilities, waste treatment, and miscellaneous sources".* This is a huge and complex series of interdependent operations.

Figure 1. New-Indy Catawba Mill and WWTP (Google)

Figure 2. New-Indy Mill and WWTP Schematic



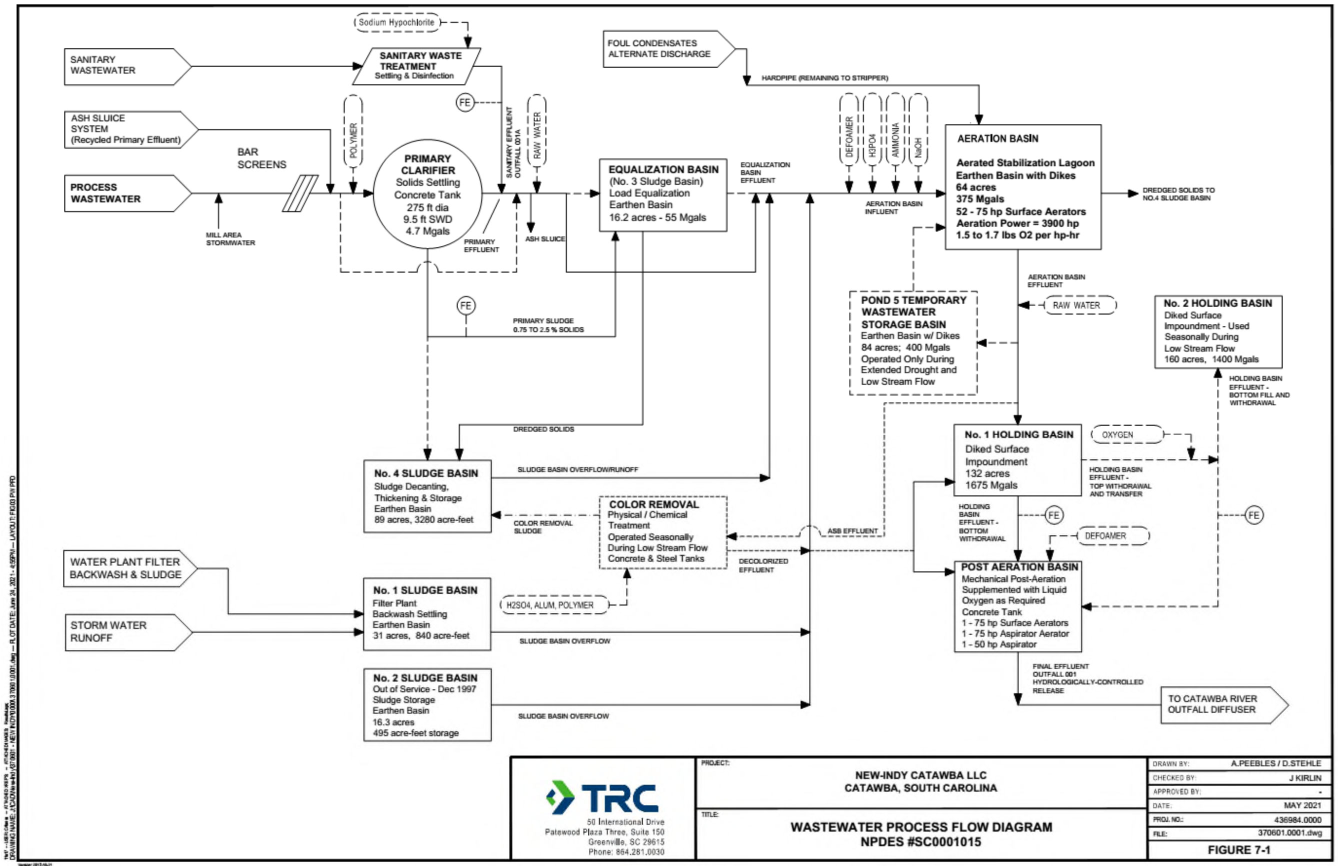
The Wastewater Treatment Process

To understand how the wastewater treatment process failed and released TRS to the surrounding communities, it is necessary to understand how it is supposed to work. This description of the general WWTP function is from New Indy's CAP:

> **"The Wastewater Treatment System is designed to collect all of the wastewaters from the mill, remove settleable solids, and biologically treat the dissolved organics. Most of the wastewater collects within the mill sewers. The sewers gravity flow to the primary clarifier. The clarifier allows solids to settle to the bottom and be removed and clarified water to overflow to either the equalization (EQ) basin or directly to the aerated stabilization basin (ASB). The solids from the primary clarifier, otherwise known as "sludge," are pumped to the EQ basin that allows additional separation (thickening) of the solids. Decant from the EQ basin flows into the aeration basin along with clarified wastewater from the clarifier. The condensate hard pipe discharges below the liquid surface of the ASB to biologically treat contaminants in the foul condensate. The treated wastewater from the aeration basin flows into holding ponds. From the holding ponds, the treated wastewater flows by gravity through a post-aeration basin where mechanical aerators increase the dissolved oxygen content of the**

wastewater prior to discharge into a receiving stream." Figure 3 gives some details on the WWTP units (from New-Indy's CAP).

Figure 3. New-Indy WWTP Details



Each of these units likely contributed to the generation of odors as follows:

1. Primary Clarifier: This round tank is 275-feet in diameter, 9.5 feet deep, and holds 4.7 million gallons. A picture of the surface of the clarifier (from the DHEC sire inspection report) is shown in Figure 4. As noted above, its purpose is to receive the wastewater from the mill and settle out the pulp fibers, grit, minerals etc. so that these inert objects do not enter the rest of the wastewater plant and take up useful space. It thus provides critical protection to the parts of the WWTP that remove pollutants from the wastewater. It normally fulfills this function adequately, with little room for error. However, the problems encountered by New-Indy during the startup of the linerboard process resulted in vast quantities of pulp being sent to the WWTP with the wastewater.

Figure 4. Surface of Primary Clarifier

Photo ID: 2
Date/Time: 3/15/2021; 1101
Description: Primary clarifier with ash layer

This also happened to be the time when New-Indy had taken the Clarifier out of service for extensive repairs. Huge amounts of wasted pulp, ash and mineral content ended up in the critical Aerated Stabilization Basin (ASB) and settled or floated – reducing the effective volume available in the ASB for removal of pollutants and causing failure of almost half of the critical aerators. EPA inspectors also reported and measured serious odors from and around the clarifier during their site visits in April 2021.

2. Equalization Basin (formerly #3 Sludge Lagoon): This is a 16-acre lagoon that holds 55 million gallons when empty but is filled with the settled solids (sludge) from the Primary Clarifier. Its purpose formerly was to smooth out (equalize) variations in the wastewater flow rate from the mill so that the next phase of treatment could operate more consistently. As an apparent cost-saving measure, the basin function was modified based on construction permit 20098-IW granted in 2017 to receive and thicken the primary clarifier sludge prior to it being dredged over to Sludge Lagoon #4 for permanent disposal. However, the planned removal of thickened sludge has been grossly inadequate, and the lagoon was observed by DHEC in March to be nearly full of accumulated sludge. Further, the flow path of the clarified wastewater is through the sludge-filled Equalization basin – and as of early July 2021, six months after startup, this flow continues to wash useless sludge solids out of the Equalization basin and into the ASB, further reducing treatment capacity. This sentence from New-Indy's Corrective Action Plan is illustrative: *"Over the last several years the (*WWTP*) process flow diagram has changed, most notably as the management of primary clarifier solids and foul condensates has changed."* Those changes included: 1) Abandoning the Steam Stripper that had removed so much odor for so many years, and 2) Sending the Primary Sludge to the Equalization Basin for 'free' dewatering (and failing to keep that sludge out of the ASB influent).

3. Aerated Stabilization Basin (ASB): This 64-acre, 375-million-gallon lagoon is the heart of the WWTP. It is here that naturally occurring microorganisms are meant to be provided with adequate mixing and oxygen to achieve efficient removal of pollutants from the wastewater. The aeration and mixing are normally provided by over fifty 75-HP aerators that float throughout the lagoon. When functioning properly, these aerators provide some 140,000 pounds of oxygen daily. Figure 5a shows what the lagoon looks like when healthy in a Google photo taken in 2005. However, there were three inexplicable failures that occurred while the linerboard process startup was completed:
   a. While the Primary Clarifier was out of service, the mill kept on operating, resulting in tons of sludge and scum solids normally removed by the clarifier being sent to the ASB, and during this time the full wastewater flow rate, normally routed around the Equalization basin, had to be routed through the sludge-filled ASB which washed many more tons of sludge into the ASB.
   b. Large loads of fiber solids were dumped from the mill during a difficult and extended process conversion and startup operation, much of it settled in the ASB.
   c. There was continual and significant erosion of the old Clarifier sludge from the Equalization Basin into the ASB.

   All these failures contributed to a massive buildup of pulp and mineral sludge within the ASB, as shown in Figure 5b, taken from a drone in June 2021. The thickness of this material was such that it caused many critical aerators to fail – they were not designed to pump thick sludge. As these aerators failed, there was less oxygen and mixing available. Over half of them eventually failed. New-Indy explained in CAP#2 that of the 52 aerators installed, only 28 were working before they had removed enough sludge to begin reaching and repairing aerators. Further, so much sludge fed into the ASB that its inherent treatment capacity was significantly reduced due to the loss of both volume and aeration. New-Indy had apparently assumed the ASB would be fully operational to justify shutting down the steam stripper and bypassing all the foul condensate to the ASB. However, multiple aerators failed in the north end of the ASB (Zone 1) where the influent entered, because this is where much of the sludge and pulp solids settled. This is obvious in the photo below. Unfortunately for local residents, this is also where the foul condensate was discharged after bypassing the abandoned steam stripper. With fewer aerators to provide mixing and oxygen, the conditions generated even more odors exacerbated the evaporation of malodorous TRS gases into the ambient air. DHEC inspected the plant in March 2021 in response to the odors and their measurements confirmed that the ASB was severely clogged with sludge and in a severely under-aerated condition – and thus odorous and incapable of performing properly.

   One can get a sense of the scale of New-Indy's WWTP failure by the shear quantities involved: New-Indy estimates the volume of useless solids to be removed from the ASB at between 750,000 – 1,000,000 cubic yards, over half the ASB volume. We do not know how much of this was already deposited prior to 2021, but aerial views of the ASB indicate that a great deal of sludge entered the basin after the process changeover. This is clear from the pictures below: the one on the left shows a healthy ASB in 2005 with all aerators operational and little or no foam or sludge visible; on the right is a photo taken from the opposite end in June 2021. The influent zone in the 2005 picture is on the upper left of the lagoon, and in the recent picture is on the lower right side. The areas of brown show accumulated foam and sludge from the lack of aeration and mixing caused by the failed aerators. Some sludge had accumulated prior to the 2021 failures but aerial views from 2017-2019 confirm that most of the deposit occurred after New-Indy's purchase of the mill. This, combined with the discharge of up to one million gallons per day of foul condensate, has been a major source of the release of malodorous and toxic chemical that has affected local residents so severely.

Figure 5a. Healthy ASB Operation in 2005

Figure 5b. Severely Damaged ASB Operation in May 2021

4. <u>#1 Holding Pond:</u> This enormous lagoon covers 132 acres and has a capacity of 1,675 million gallons when empty. New-Indy recently stated in their CAP:

    "This pond is not intended to provide treatment and only serves as a retaining basin for managing the mill's hydrograph-controlled release NPDES permit that essentially regulates discharge flow based on river flow".

    However, the lagoon does "provide treatment", and it is treatment for which it was not designed. This holding pond actually serves a dual purpose in that the water entering from the ASB contains solids such as micro-organisms, wood pulp, and various inert minerals that must be settled out before the water can be discharged to the Catawba River. The lagoon is partially filled with settled sludge, and no information on the actual sludge level has been reported in recent documents submitted by New-Indy to DHEC. It is difficult to understand the decision to also use this lagoon as a Clarifier for ASB effluent solids. Prudent design would use a dedicated lagoon as a clarifier, or a dedicated clarifier(s). Even New-Indy admits, per the quote above, that this is not a good application for this lagoon. And yet the pond is used as a clarifier. There is no means to remove these solids short of dredging them out, which could well produce poor effluent that would violate the discharge permit.

    When thousands of pounds of biodegradable solids enter an unaerated lagoon every day, nature will take its course and septic conditions in the accumulated sludge will generate odors and produce more noxious TRS fumes. That apparently is what has happened based on H2S levels measured by EPA during its April 2021 inspection. It was worsened by the exceptional loss of solids during the first half of 2021. New-Indy has responded by pumping in ferric chloride to the influent stream (the discharge from the ASB) in an attempt to neutralize the odorous sulfide compounds in the 132-acre lagoon. New-Indy also placed a couple of floating aerators in the lagoon to help with mixing and aeration. Since there are no reported measurements of H2S or TRS since April, it is unclear how effective these measures have been to reduce H2S and TRS emissions from #1 Holding Pond.

Figure 6. Holding Lagoon # 1

Figure 7. Post Aeration Basin

5. <u>Post Aeration Basin</u>: This tiny concrete basin, shown in the picture on the right, sits on the bank between the south end of #1 Holding Pond and the Catawba River. It can barely be seen in the aerial view of the #1 Holding Lagoon above the ‘t’ in ‘Catawba’. This exists as a wide spot in the line to allow some aeration to raise the level of dissolved oxygen in the plant effluent to meet discharge permit requirements.
   EPA inspectors measured high concentrations of hydrogen sulfide here during their April site inspection. New-Indy responded by covering the basin with a tarp and scrubbing the air through a carbon filter to remove TRS fumes. New-Indy then heavily promoted this as a significant victory in the fight against odors, even suggesting that the release of odors would be largely reduced as a result. It was a bizarre claim for such an insignificant source. Water from this basin flows into the Catawba River, and if there is odor here, then the effluent – the supposedly clean water – contains significant concentrations of hydrogen sulfide and likely other forms of total reduced sulfur (TRS) that present a water quality problem.

   Measurements of the hydrogen sulfide concentration in the #1 Holding Pond over the past few months are typically around 2,000 parts per billion. This is significant since sulfides are toxic or inhibitory to aquatic organisms at concentrations above just 2 parts per billion. There is no published data on the sulfide concentration of the final effluent (after the post-aeration basin) because New-Indy is not required by their NPDES permit to measure sulfides even though they should be to protect water quality in the receiving stream. The New-Indy effluent is diluted by approximately 100 times when it discharges into the Catawba River, but that still would leave a sulfide concentration of 20 parts per billion where 2 parts are considered problematic.

6. <u>Wastewater Load</u>**.** The production of paper or linerboard requires a huge amount of water. The amount of water used in the mill is directly proportional to the rate of paper production. In its permit application to convert to the linerboard process, New-Indy stated that changes to the production process for the linerboard conversion would cut the wastewater flow rate in half. However, as shown in Table 1 below, in the first five months of 2019, which was prior to the conversion, the New-Indy discharge monitoring reports to DHEC show the mill discharged an average of 19.7 million gallons per day (MGD) to the river. In 2020 (also prior to the conversion) the average discharge was about 22.2 MGD. Since the conversion

to linerboard, reported by New-Indy to have occurred on Feb. 1, 2021, the average discharge rate to the wastewater treatment plant through June has been 26 MGD. So, either there was no decrease in flow rate, or New-Indy doubled the mill production rate. Possibly a combination of both. New-Indy continued to run at this rate even though the toxic odors were causing so much distress. New-Indy could have elected to reduce mill throughput in order to reduce the pollutant load to the WWTP and thus reduce odor generation to a tolerable level. It appears they chose not to do so.

Table 1. New-Indy Monthly Average Discharge Rate

Month	2019	2020	2021*
February	26	24.8	**26**
March	19.2	23.6	**26**
April	18.2	23.7	**25**
May	19	22.6	**27**
June	16.1	16.2	**26**
Average	19.7	22.2	**26**

Data from the monthly discharge reports to DHEC.
* Linerboard process startup Feb 1, 2021; 2021 flow rates are ASB feed flow from New-Indy CAP Rev. 2.

7. Sludge Lagoon #4: This 89-acre lagoon (about 37-feet deep) has been used for multiple purposes:
    a. Sludge Thickening and Dewatering for sludge, floating solids, and foam from the Clarifier, Equalization Basin (#3 Sludge Basin), and the Aerated Stabilization Basin.
    b. Landfill for Dewatered Sludge.

Figure 8 is a picture of Sludge Lagoon #4 taken from a drone in June 2021.

Figure 8. Sludge Lagoon #4

As a landfill for soil and dewatered material, Sludge Lagoon #4 is contaminated with Dioxins, Furans, and/or other toxins. DHEC requires New-Indy to collect and submit biennial monitor well sampling data. This data goes back to 1988 and includes pH, Chloroform, Conductance, Barium, Nitrate, Cadmium, Chromium, Lead, Mercury, Sulfate, TKN (organic nitrogen), Ammonia, TDS (dissolved salts), and Phosphorus. New-Indy sends the lab results to DHEC with a brief description of the results and trends. These do not appear to include results for Dioxins and Furans which have been measured in 1) the soil around the site, 2) the “Legacy Sludge” produced by the mill and WWTP, and 3) sludge, soil, and foam from the various lagoons. The Voluntary Cleanup Oversight Contract (VCOC) signed by New Indy in December 2018 reported that soil and sludge samples from around the mill and WWTP site were contaminated with toxic chemicals including Dioxins and Furans and required sampling for these compounds as appropriate. It further mandated that New-Indy close and cap Sludge Lagoon #4 as a Class 3 landfill (the most rigid closure requirements per Regulation 61-107.19 Part V and S.C. Code Section 44-96-390). DHEC reports and letters indicate that New-Indy has not only been lax in closing this sludge lagoon but intends to continue using it for many years.

As Sludge Lagoon #4 is located immediately adjacent to the Catawba River, it is important to determine whether the lagoon is properly lined on its bottom and sides and sealed so that here is no leakage. Adequate sealing is unlikely, due to the age of the lagoon. If there is leakage of contaminants that are capable of reaching the Catawba River, New-Indy should provide a hydraulic barrier and/or take other remedial actions that protect the river.

Required Actions to Prevent Future Occurrences vs New-Indy's Response

1. **Current and Future Effluent Quality.** New-Indy's NPDES discharge permit was issued in 2009 and expired in 2014 and has been administratively extended by DHEC for the past seven years without proposing a new permit. The outdated permit should be updated promptly to account for New-Indy's new production process and additional information and data collected as discussed above to assess performance and the need for upgrades. For example, New-Indy should be required to add "Total Reduced Sulfides" to its monitoring requirements for both air and water due to its toxic nature. Further, it is not clear why New-Indy is allowed to discharge many times the pollutants allowed for most municipal WWTPs. New-Indy is allowed, for example, to discharge some 100 mg/l (parts per million) of BOD (organic contaminants) and approximately 200 mg/l of TSS (total suspended solids). Municipal wastewater dischargers are typically required to discharge less than 30 mg/l of BOD or TSS and less than 1.0 mg/l of Ammonia.

2. **Wastewater Treatment Plant Units:** The many failures with New-Indy's process switchover have demonstrated that this mill must not continue to operate with a single train of wastewater treatment units. The failures of this system occurred because there was no spare capacity and no parallel treatment units to accommodate a significant upset condition. Most WWTP's in this country are required to have at least two oversized parallel treatment trains, so that when (not if) a unit fails, or must be removed from service for maintenance, the parallel unit can take up the slack for a significant length of time to allow repair/maintenance/cleanup of the offline unit(s). New-Indy should be required to make the following modifications and additions to their Catawba Mill WWTP in order to protect the community and the receiving waters from extended WWTP failures such as presently exist.

    a. **Steam Stripper.** DHEC has reported this stripper could treat about half of the foul condensate. The decision to remove the steam stripper from service contributed significantly to the release of malodorous and dangerous chemicals. New-Indy should install a second steam stripper of sufficient capacity to treat all foul condensate so that there is, with the other WWTP additions and modifications described below, much greater assurance of a similar failure not happening again. This would also allow a stripper to be removed from service for maintenance without the likelihood of additional malodorous and toxic chemicals being emitted from the WWTP. New-Indy's status reports to DHEC indicate that the existing stripper has already been removed from service twice for maintenance in the past few months. New-Indy's Corrective Action Plan makes no mention of increasing steam stripper capacity which is an essential improvement needed to prevent the ongoing and future H2S and TRS emissions to the surrounding communities.

    b. **Primary Clarification.** The decision to take the clarifier offline for service was apparently necessary; the decision to commence full-scale production without a functioning clarifier was a major contributor to the overall failure of the WWTP. As stated in New-Indy's O&M Manual, operation of the single Clarifier requires "maintaining a fine balance" in order to have satisfactory performance. This is an accident waiting to happen given the amount of fiber and other solids in the wastewater generated by the mill. A second, and perhaps a third (depending on size) clarifier would: 1) provide greatly simplified and thus more reliable operation with more consistent results; 2) provide capacity to readily handle future spills, failures, and mill upsets; and 3) help greatly to ensure that the WWTP's gross failure never happens again. Primary Clarification is the process that protects the entire rest of the treatment process – it absolutely must be robust. Right now, this plant is one accident, one major equipment failure or maintenance event away from another crippled WWTP. New-Indy should be required to install at least a second 275-ft diameter Primary Clarifier, and really should have a third primary clarifier due to the potential for another massive and sustained loss of pulp. Primary Clarification has proven to be critical to the successful operation of the WWTP. It is essential to have industry standard spare capacity for unexpected events and for maintenance. This will contribute greatly to the success of future operation. However, New Indy's Corrective Action Plan does not include any additional clarification capacity.

c. **Equalization Basin.** New-Indy should separate the influent wastewater flow from the thickening of Clarifier sludge. There can be no path back into the WWTP for the wasted Clarifier sludge. This lagoon must either be internally diked to permanently separate the two streams, or the sludge should be sent to and thickened in Sludge Lagoon #4 as was previously done. Further, this lagoon must be brought up to current standards by being properly dredged and then lined with a leak-proof geo-polymer liner to prevent contamination of the groundwater. New-Indy stated in its Corrective Action Plan that it will continue to remove sludge from the basin but has not indicated it will cease sending sludge from the clarifier or line the Equalization Basin.

d. **Aerated Stabilization Basin.** The ASB must be restored to working condition and all aerators placed back into operation. New-Indy and its contractors and consultants have begun this process but are merely seeking to return the WWTP to a functional state. Much more is required to make this WWTP robust and stable in the long term and prevent future failures. The ASB failure was caused by 1) the failure of the single Primary Clarifier, 2) New-Indy's mistake of filling the Equalization Basin with sludge and allowing it to wash into the ASB, 3) the fact that there was no spare capacity, no standby or parallel clarifier or aeration basin to rely upon. The critical ASB process should be duplicated. The Temporary Wastewater Holding Lagoon (Lagoon #5) is adjacent to and already overflow-connected to the ASB. It holds 400 million gallons and the ASB holds 375 million gallons once it is cleaned of sludge. It would be logical and relatively simple to add aeration to Lagoon #5 and then have a 100% standby capacity. This would also help produce an effluent to the Catawba River that was much higher quality than in the past.
It is critical that both lagoons be brought to modern standards and sealed and lined with a geo-polymer liner. This will stop the leaking of pollutants to the groundwater. Lagoon #5 should be dredged and cleaned and lined (if not already), then equipped with aerators and any necessary flow baffles. Then the raw wastewater can be directed to the new ASB #2 while the existing ASB is drained, fully dredged, cleaned, and then lined and sealed. New-Indy and its contractors reportedly have removed much sludge, repaired and replaced some of the aerators, and begun adding chemicals to try and neutralize some of the odors. However, there is no indication in New-Indy's Corrective Action Plan when the current remediation of the ASB will be completed. Nor does the CAP indicate that New-Indy intends to line the existing ASB or add a second ASB to provide backup capacity and improve the effluent being discharged to the Catawba River.

e. **#1 Holding Lagoon.** This lagoon will always generate odors because the 10,000 to 20,000 pounds of solids arriving from the ASB every day will settle out in this lagoon and start to produce odor and reduced sulfides (TRS). That is why over 2 mg/l of Sulfide was being measured in the lagoon many months after startup of the new process, and New-Indy installed aerators and started paying to have sulfide-neutralizing chemicals pumped into the vast lagoon. Even if the odors are normally minimal, they will be excessive whenever septic settled sludge is dredged and removed. The WWTP requires significant diking of this lagoon to separate the ASB effluent solids-settling function from the effluent flow equalization function. Alternatively, installation of two Secondary Clarifiers between the ASB and the Holding Lagoon would provide vastly improved process control ability and would ensure that ASB solids (which include the microbes responsible for removing pollutants) are removed and kept out of the Holding Lagoons entirely. These solids can then be either returned to the ASB to increase efficiency and reliability or be sent to Sludge Lagoon #4 for dewatering and disposal. This capability would give New-Indy WWTP operators the ability to manage and have a measure of control over the WWTP process. They could, when appropriate, decide to increase or decrease the concentration of active and beneficial microbes in the ASB for which they have no such control now. This will guarantee a much cleaner effluent going to the Catawba River, provide much improved operational stability, and virtually eliminate the production of odors from various Holding Lagoons once they are all properly dredged, cleaned, and lined to current standards. New-Indy reports that it is adding oxidizing chemicals to neutralize odors as a temporary measure. However, the Corrective Action Plan does not indicate any other plans to improve performance.

f. **Post-Aeration Basin**. New-Indy has emphasized the importance of this basin for removing odor. Therefore, there should be a second, identical basin with similar equipment. Further, each basin should be equipped with a sulfide monitoring system that controls both the aerators and chemical feed pumps to add oxygen and sulfide-destroying oxidant as necessary. As a temporary measure, New-Indy has covered the basin with a tarpaulin and is scrubbing the off-gas in an attempt to remove at least some of the malodorous TRS. However, the Corrective Action Plan does not indicate any intent to provide any spare capacity or install a sulfide monitoring system.

g. Sludge **Lagoon #4.** It is not clear from the documents reviewed at this time whether this lagoon is leaking. This is especially critical with the presence of dioxin, furans, and other toxic chemicals likely present in the sludge. Sampling has shown toxic contamination as low as 80-ft deep in this 37-ft deep lagoon. There are liners visible in some zones, but their coverage and integrity apparently have not been determined. The entire lagoon should be assessed and made leak-proof. The river should be protected with a groundwater barrier such as a leachate pump-and-treat system if it is not already. New-Indy previously advised DHEC that it would increase the sludge removal rate and cap the sludge lagoon. However, New-Indy recently stated its intent to continue to use the lagoon until it is at full capacity.

h. **Reduce Load to Match Treatment Capability.** As noted above, New-Indy should not be allowed to continue to run the mill above the capacity of its WWTP to adequately treat the quantity of wastewater produced and without releasing malodorous and toxic levels of TRS and other pollutants to the surrounding communities. Wastewater volume and quality is directly related to production rates. Until New-Indy can implement the improvements described above, it should reduce pulp production to limit TRS emissions and achieve a higher quality effluent. New-Indy's Corrective Action Plan makes no mention of this obvious method to immediately reduce odors in the community.

Please let me know if you have any questions concerning the above.

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President, Wastewater Experts
Attachment

APPENDIX: Analysis of New-Indy's Permit to Shut Down the Steam Stripper

Analysis of the New-Indy WWTP in 2021 vs. the Assumptions Inherent in NCASI's Simulated Aerated Stabilization Basin Model (Version 4.2) Used to Justify DHEC's Permit # TV- 2440-0005-DF

In 2019, shortly after purchasing the Pulp and Paper Mill on the Catawba River in South Carolina, New-Indy applied for a permit to convert mill operation from the traditional white paper to brown linerboard. As part of that process, New-Indy decided to halt operation of the Foul Condensate Stripper that treats and removes much of the malodorous and toxic reduced sulfur compounds (TRS) typical of such mill wastewater before it is discharged. Instead, the foul condensate was piped directly to the inlet zone of the Aerated Stabilization Basin (ASB) for attempted biodegradation that was not possible due to the poor condition of the ASB.
This modification in operating procedures was approved by DHEC based on the modelling completed by one of New-Indy's consultants using the NCASI (National Council for Air and Stream Improvement) *Simulated Aerated Stabilization Basin Model* (*Version 4.2*) with data from the ASB operation in 2015. We do not have a copy of that particular model run because it was redacted in the New-Indy permit applications but there are a number of assumptions built in to any such model. It was noted in their application that New-Indy expected to reduce the flow and organic load of wastewater by about 50%. However, data indicate that this did not occur. The mill officially started operation with the new process on February 1, 2021. New-Indy's Corrective Action Plan explains what went wrong, as shown below. The conditions of operation New-Indy gave the Consultant to base the NCASI model results upon were utterly corrupted by unplanned errors and failures of operation in the Mill and the Wastewater Treatment Plant (WWTP). Some of these failures were obvious in May 2020 - when New-Indy applied to DHEC to shut down the steam stripper - based on the out of service aerators and foam in the ASB visible on satellite imagery available from that time period.

From p. 7-5 of the CAP Revision #2) (emphasis added for clarity)

> "The increase of foul condensate loading to the ASB through the hard pipe option under the Title V permit and MACT Subpart S appears to have increased the load of both BOD_5 and sulfur compounds. The loading of the anticipated foul condensate and anticipated wastewater from the converted, unbleached manufacturing operations into the ASB was modeled in 2019 utilizing NCASI's Simulated Aerated Stabilization Basin Model (Version 4.2). The ASB parameters in the model were established using the 2015 solids survey results based on the facility's assumption that additional sludge accumulation since 2015 was approximately equal to the amount of sludge that was removed as part of maintenance dredging since that time. The 2019 modeling indicated that the ASB could sufficiently treat the foul condensate and enable the wastewater treatment system and comply with current (and anticipated) NPDES permit requirements. After the conversion and restarting of the mill, however, the thick layer of fiber formed on the basin reducing the aeration capacity of the basin. This reduced aeration capacity and sludge accumulation that has reduced mixing and disruption of the flow path through the basin have hindered the basin's ability to perform as modeled. The two main operational issues in the ASB that pose the potential of causing or contributing to elevated levels of hydrogen sulfide have been the formation of the floating fiber layer and the accumulation of settled solids. "

From New-Indy's Corrective Action Plan, Rev. 2, p2-1:

> "New-Indy was issued Construction Permit #2440-0005-DF on July 23, 2019, in accordance with state and federal air quality regulations and standards, to allow the mill to modify its processes to convert from bleached paper production to brown paper production. The construction permit was revised on May 13, 2020, to allow the mill to hard pipe its condensates to the wastewater treatment plant. 40 CFR 63, Subpart S, allows this hard piping as a compliance option. New-Indy began start-up operations at the mill as an integrated pulp and paper facility manufacturing brown paper on February 1, 2021."

From the same document, p 3-10:

> "The foul condensate treatment system was modified to use the hard piping option to biologically treat the foul condensate in the ASB. This modification was approved by DHEC with permit TV- 2440-0005-DF.

> The hard pipe has no emissions points. The mill is not required by regulation to analyze the foul condensate that is hard piped to the ASB for temperature, pH, or other parameters. Likewise, the mill has not analyzed the foul condensate to determine its consistency or concentration of constituents other than methanol and TRS compounds."

Again, from p. 7-3, New-Indy's explanation of the predominant cause and source of the toxic releases of reduced sulfur compounds (emphasis added for clarity):

> "An aerobic biological treatment system utilizes aeration and bacterial metabolism to convert biodegradable compounds (BOD) in the wastewater into additional bacteria, water, and carbon dioxide, an odorless gas. <u>In the absence of sufficient dissolved oxygen, the bacterial population will shift to a sulfate reducing scenario, where sulfate replaces oxygen as the terminal electron acceptor, with resultant H_2S formation.</u>"
>
> "The predominant issues that have hindered aeration and mixing in the ASB have been the formation of the floating layer of fiber and the accumulation of settled solids. Excess fiber loading into the ASB combined with production liquor losses has led to the formation of a thick, floating layer of fiber and covering areas of the early aerated zone. The fiber and liquors losses arose during mill conversion and recommissioning. <u>The floating solids layer contributed to the breakdown of multiple aerators in the front end of the system. This loss of aeration capacity led to a reduction in biological treatment capacity and resulted in reduced aerobic or anaerobic conditions. Sulfate reducing bacteria when present under anaerobic conditions metabolize BOD by utilizing sulfate as a terminal electron acceptor when there is no dissolved oxygen present, thus producing H_2S as a byproduct. The floating solids also represent biodegradable material that dissolve over time, adding additional oxygen demand to the system. The accumulated solids in the ASB have reduced the hydraulic residence time in the basin for treatment and impacted the flow path through the basin. Solids accumulation occurs from solids loading in the influent as well as settling of biomass generated as part of normal biological treatment. The influent loading comes from solids that may not have been removed during the primary clarification process or primary solids that have become re-entrained in wastewater due to the primary clarifier underflow in the EQ basin. The reduced treatment efficiency and less aerated conditions caused by the floating fiber layer and accumulated solids and H_2S production appears to have contributed to elevated concentrations of H_2S in the effluent from the ASB to No. 1 holding pond. No. 1 holding pond retains wastewater prior to undergoing post-treatment aeration in the post-aeration basin. In the post-aeration basin, large surface aerator/mixers aerate the wastewater in a rectangular, concrete basin. This aeration has the potential of releasing hydrogen sulfide that may be in the wastewater. Additionally, the reduced retention time, inoperable aerators, and biodegradable solids (floating sludge) all may have contributed to higher-than-normal soluble BOD levels in the water leaving the ASB and entering the No. 1 holding pond. While the BOD levels of this water met the requirement for discharge to the receiving stream, the additional BOD served as an oxygen demand in the unaerated No. 1 holding pond, which appears to have resulted in additional sulfate reduction and H_2S formation."</u>

The only logical reason for New-Indy to have idled the Steam Stripper was to save money. Excessive releases of malodorous and toxic sulfide air pollutants from the New-Indy WWTP were predictable, and a significant portion of those releases appear to have been the result of this decision to idle the Stripper. The H2S and TRS emissions from the ASB have continued long after New-Indy put the Steam Stripper back into operation because: 1) the existing steam stripper has insufficient capacity to treat all of the foul condensate before hundreds of thousands of gallons per day is dumped into the ASB, and 2) the massive overloading of the ASB with sludge, foam, and organic pollutants (BOD) left large portions of that basin in an anaerobic, low-ORP, sulfide-generating state.

The standard kinetic model used in the industry for prediction of noxious sulfide gas releases from the ASB is published by the National Council for Air and Stream Improvement (NCASI). In their notes on the model (Technical Bulletin No. 1000), NCASI states the following:

1. The model makes relatively accurate predictions as long as the aerated stabilization basin (ASB) operates at similar conditions to the installations used to develop and calibrate this model.
2. The model is based upon basin properties such as pH (acidity). Dissolved Oxygen concentration, and aerator configuration.
3. A sensitivity analysis performed on the model inputs (used to identify which of the ASB operating parameters most affect the release of sulfide gases) indicated that wastewater **pH** and **oxidation-reduction potential (ORP) are critical to model performance, have the greatest effect, by far, on sulfide generation, and thus should be characterized as accurately as possible.**

It is pertinent to consider NCASI's advice on the model and compare the model's requirements to the actual conditions under which the New-Indy WWTP operated for much of 2021 to see if the actual conditions Pass or Fail the requirements:

1. *The Model requires ASB operation to be in a suitable range for pH, Dissolved Oxygen, and aerator configuration, similar to the actual installations upon which the model is based:*
    a. pH: PASSED - The operating pH range of the ASB was within the model's range.
    b. DO: FAILED - The Dissolved Oxygen concentration was critically lower than required by the model.
    c. Aerator Configuration: FAILED - New-Indy's ASB completely failed this requirement due to a massive overloading of the ASB with pulp solids and inert material which caused the loss of 25% to 46% of the critical ASB aeration capacity as well as a large fraction of the useable volume in the ASB.
2. Oxidation-Reduction Potential (ORP): FAILED – Apart from pH, this is the defining, critical, operating parameter for an ASB because it determines which way the chemical reactions will go. If ORP is in the desired range, as for the plants used to calibrate this model (ORP above 50) then the ASB will not generate sulfide gases. If ORP is too low (below -50), then the ASB will generate noxious sulfide gases. This is shown in the chart below from the Water Environment Federation (WEF):

Biochemical activity	**Approximate ORP range***
Carbon oxidation (carbonaceous biochemical oxygen demand stabilization)	+50 to +200
Polyphosphate accumulation	+50 to +250
Nitrification	+150 to +350
Denitrification	−50 to +50
Polyphosphate release	−40 to −175
Acid formation	−40 to −200
Sulfide formation	−50 to −250
Methane formation	−200 to −400

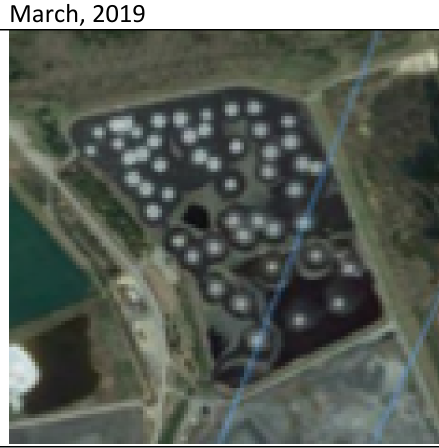
The WWTP completely failed this critical requirement as shown in the table below, with ORP values ranging down to -169 – well into the sulfide generation range. And the ORP value would have been even lower in much of the ASB due to the unprecedented accumulation of sludge and wasted pulp solids. In these vast deposits, it is reasonable to assume the ORP was deeply negative – well under -200.

The table below shows a summary comparison of operating parameters required by the model, and the actual operating conditions in the ASB. Note that precise "Actual" values used by New-Indy's consultants in their predictive modelling are unknown to us, as are some of the actual WWTP operating parameters, due to the redacted appendix in the construction applications. However, some of the "Actual" values shown below are based upon ASB measurements from May 2021 by a New-Indy consultant.)

Critical Operating Parameters for the New-Indy WWTP	Model Assumed Value (Assumed and Approximate)	Actual WWTP Operating Value (Estimated, February – May 2021)	Actual vs. Modelled	Impact on Estimated Performance of Aerated Stabilization Basin (ASB)
Aeration Capacity, # of 75-HP Aerators Operating in ASB	**49 to 52**	**28 to 38**	**54% to 75%**	**Too little aeration generates sulfides, and produces poor effluent to river**
Aeration Characteristics	**3.0 lb O_2/HP-hr**	**2.0 lb O_2/HP-hr**	**33% less**	**Less Oxygen enhances sulfide emissions**
pH	**6.4 to 8.8**	**7 to 10**	**Over 10 times greater at the inlet**	**Should have reduced sulfide emissions near the inlet**
Total ASB Volume	**150 MG**	**55 MG**	**37%**	**Less time to treat waste**
Density of Liquid, lb/ft^3	**62**	**>62**	**Too dense for some Aerators to Pump**	**Over 40% of critical Aerators broke down as a result**
RedOx Potential, ORP	**50 to 100**	**-200 to -30**	**Anaerobic/Anoxic vs Aerobic Operation**	**Actual condition favors formation and release of TRS compounds**
Dissolved Oxygen Concentration	**0.1 to 0.5 mg/l in the front end, 1.5 to 2 mg/l in the rest**	**0 mg/l in the front end; 0.2 to 0.65 in the rest of the ASB**	**Much Too Low**	**Low DO causes Odors and poor effluent to River. Not anticipated.**
Inlet Sulfide Concentration	**0.1 mg/l**	**> 2 mg/l**	**~20 times greater**	**Malodorous release of Hydrogen Sulfide**
Inlet Organic Waste Load	**50% of historical value**	**Appears to be close to historical value**	**Greater**	**Exacerbates low-ORP release of sulfides**
Wastewater Flow Rate	**13 million gallons per day**	**26 million gallons per day**	**200%**	**Half the time to treat the waste load**

As noted above and in the NCASI documentation, healthy and adequate aeration and mixing is a critical component of a well-operated ASB that prevents the release of sulfide emissions: without adequate aeration there will be low ORP in the wastewater and much greater formation and release of sulfides. New-Indy filed for the permit to decommission the steam stripper in May 2020 based on a NCASI sulfide emission model run with data from 2015. However, it appears from the aerial photos below that the operation in the ASB October 2014 was superior to that in both March 2019 and May 2020:

1. In October 2014 the ASB was operating with 48 critical aerators, and there were still 48 aerators operating in March 2019. However, on April 28, 2020, two weeks before the permit change application was filed, there were only 38 aerators in operation, as the picture below shows. There were apparently 26% more aerators in operation in the 2015 and 2019 time periods New-Indy based their emissions model on. Since aeration determines mixing and oxygenation and that in turn determines the operating ORP in the wastewater, and ORP has the greatest effect on sulfide formation and release – more aerators usually mean less sulfide emitted.
2. The superior operation in late 2014 is further indicated by the color of the ASB – note that it was a light brown color – this is a common indicator of healthy biological operation. However, the March 2019 and April 28, 2020, pictures show the color of the ASB was black – this is a classic sign of insufficient oxygen (likely caused by 26% fewer aerators in 2020), poor operation, and/or excessive, old foam. It should be noted that pulp mill wastewater often runs a dark color, but these pictures indicate degraded operating conditions in the ASB in 2019 and 2020 by comparison.
3. The pictures show that in late 2014 there was foam in the influent end (the northeast section of the ASB) where the white aeration patterns are small round spots. However, the rest of the basin had little foam and the aeration patterns were full and wide as indicated by the large white "splash flowers" around each aerator. But in the March 2019 the foam was excessive – drowning the aerators. And in the April 28, 2020, picture the dark foam suppresses the aerator splash throughout most of the basin. This excessive foam causes reduced aeration efficiency since the necessary exchange of air is inhibited by the foam, and it is not seen in ASB photos available to us until after New-Indy bought the site.

October, 2014	March, 2019	April 28, 2020
		

ASB operation in 2021 has, as shown in the above comparison chart, seen every relevant ASB operating parameter outside of the acceptable range required by the model except for the pH. Only the alkaline character of the wastewater – the elevated pH in parts of the ASB - would have the effect of suppressing sulfide emissions. The consistent measurements of sulfide compounds around the ASB are proof that the sulfide suppression effect of the pH was not nearly enough to overcome the very low ORP values that generate sulfide emissions. It is clear from this comparison that the NCASI model was not validly applied to predict the increased emission of reduced sulfides from New-Indy's WWTP.

Norcross Report – Reference List

1. DHEC Catawba River Study 6/28/2021
2. EPA New-Indy Catawba 4.15.21 Inspection Report
3. EPA New-Indy Containerboard Final GMAP
4. New-Indy DHEC Air Quality Inspection Report Feb 2021
5. New-Indy Catawba DHEC Notice of Violation July 2021
6. EPA Order 5132021
7. DHEC Compliance Inspection Report from March 2021 Site Visit
8. DHEC New-Indy Weekly Status Update Reports
9. New-Indy Construction Permit Application 2440-005-DF
10. New-Indy Corrective Action Plans #1 and #2
11. DHEC Responses to Corrective Action Plans
12. New-Indy Voluntary Cleanup Oversight Contract (VCOC)
13. New-Indy Annual NPDES BMP Report
14. New-Indy Biennial Groundwater Monitoring Report 2019
15. DHEC VCOC Site Inspection Report March 2021
16. New-Indy Construction Permit No. 20098-IW
17. New-Indy BAQ Stripper Restart Approval
18. New-Indy Catawba Condensate Collection and Treatment IPT plan
19. New-Indy's Initial Performance Test on the Condensate Collection and Treatment

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- New-Indy DHEC-CAP-report-Rev-2 7-12-2021
- New-Indy-Voluntary-DIOXIN-cleanup-oversight-contract
- Groundwater Sampling Reports FOIA Documents - SC0001015-Less Compliance & Enforc.
- VOCC Inspection by DHEC re Dioxin and Sludge Lagoon #4 Mar-2021

- 20098-IW Resolute EQ Basin and dewatering improvements (2)

- NewIndy_BAQ_StripperRestartApproval

- Toxicity of H2S to Fish
- Chart of Solids removed from ASB - New-IndyDHEC-CAP-report-Rev-2 - p492
- Case for Supersaturation for O2 over Oxidative Chemicals
- New-Indy Catawba Condensate Collection and Treatment IPT Plan Update - 5...
- Phase I Environmental Assessment Resolute-FP-US-Inc-v-New-Indy-Catawba
- O&M plan
- New-Indy Catawba LLC Final Operating Procedures - 5-24-21.pdf - AEC Cloud
- New-Indy CAP-report 6-15-2021
- DHEC Response to NI CAP NICB 6_20_21 Response to CAB w cover
- Kraft Process Diagram
- Kraft Wood Pulping Process - EPA

- Letter Response to Courtney Beltz - 3rd Draft

17509-IW combined files re Industrial Landfill

20098-IW Eq Basin and Sludge Dewatering Changes - Construction Per...

b. Current Wastewater NPDES Permit-2011-01-01

Landfill and Waste Permit 20534-FOIA

New Indy Catawba NOAV_EC (July 2021)

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