NEW INDY CONTAINERBOARD

December 2, 2021

John P. Glass Jr.
Bureau of Air Quality, Modeling Section Manager
South Carolina Department of
Health and Environmental Control
2600 Bull Street
Columbia, South Carolina 29201

Re: Responses to Corrective Action Plan Air Dispersion Modeling Comments

Dear John:

New-Indy Catawba LLC (New-Indy Catawba) appreciates the South Carolina Department of Health and Environmental Control's (SCDHEC or DHEC) review of the Mill's ambient air dispersion modeling report. As requested in your email dated November 17, 2021, New-Indy Catawba has updated the ambient air dispersion modeling report Tables and is providing the below responses to each of the comments.

November 17, 2021 Comments from SCDHEC:

General –

1. Please provide a drawing or picture that shows all the locations of the sources covered in the analysis, to include: Closed Trench No. 1, Ditch 0, Splitter, Open Sump No. 4, Closed Trench No. 5, Clarifier, Ditch 1, Ditch 2 with respect to the ASB, EQ Basin, Post-Aeration, Holding Pond, and Sludge Pond. Also provide an explanation of the wastewater flow through the wastewater treatment plant.

New-Indy Catawba Response 1: The drawing is provided in Attachment 1. Wastewater flow through the treatment process is indicated by blue arrows. Wastewater flows through the wastewater treatment plant through each of the following units in the corresponding order:

1. Closed Trench No. 1
2. Primary Clarifier
3. Ditch No. 0
4. Splitter and Open Sump No. 4
5. Closed Trench No. 5
6. EQ Basin
7. Ditch No. 1
8. ASB
9. Ditch No. 2
10. Holding Pond No. 1
11. Post-Aeration Basin

Sludge from the primary clarifier enters the EQ basin for settling and dewatering. Free water from the primary clarifier sludge flows over the EQ basin into Ditch No. 1. Settled solids from the EQ basin and ASB are removed and placed in Sludge Pond No. 4.

2. The emissions estimates and modeling do not include any H2S/TRS emissions from the No. 1 and No. 2 Sludge Ponds, and the Temporary Effluent Holding Basin. Please explain whether these ponds/basins are part of the wastewater treatment process, how these units are used, why emissions were not estimated from these units, etc.

New-Indy Catawba Response 2: The No. 1 and No. 2 sludge ponds are not currently used for managing wastewater or primary clarifier sludge. The No. 1 sludge pond is filled with rainwater. The No. 2 sludge pond receives the backwash from the filter plant used to treat the incoming raw river water. The temporary effluent holding basin is used during extreme drought to store treated wastewater transferred from the No. 1 Holding Pond. The temporary effluent holding basin was last used during the extreme drought in 2008. The temporary effluent holding pond and the No. 1 and No. 2 sludge ponds do not contain any material expected to generate H2S/TRS emissions, so they are not included in the emissions estimates or the modeling.

3. Please provide a rationale/explanation for all the assumptions that were made for the data presented in the analysis (e.g., why the closed trench No. 1 will not have emissions to the air, etc.). Also, please provide a discussion of the differences in the data between the current report and the August 2021 modeling analysis report.

New-Indy Catawba Response No. 3: The emissions rates are based on site-specific data and/or stack test results used in conjunction with the United States Environmental Protection Agency (USEPA) or National Council for Air and Steam Improvement (NCASI) air emissions models. The October 5, 2021 and October 27, 2021 responses submitted by New-Indy Catawba and the footnotes to each table in the October 2021 modeling report describe the defaults used in the air emissions models and assumptions (See Appendices A and C of the October 2021 modeling report).

There are numerous differences in the data between the August 2021 modeling report and the October 2021 modeling report. The significant differences are related to the changes mandated by the South Carolina Department of Health and Environmental Control (DHEC) and USEPA regarding the numerous non-detect values in the June 2021 stack test report and the July 2021 40 CFR 63 Subpart S Initial Performance Test (IPT). New-Indy Catawba addressed these and other comments from DHEC and USEPA regarding the June stack test and July IPT on October 5, 2021. New-Indy Catawba also responded to DHEC and USEPA comments regarding the August 2021 modeling report on October 27, 2021. Please refer to the October 5 and October 27 responses submitted by New-Indy Catawba for discussion of the changes to the data in response to the DHEC and USEPA comments. Additional changes to the data between August 2021 to October 2021 are described in responses 5, 6, 7, 8, 10 and 11 of this document.

Regarding your specific example, the WATER9 air emissions results for closed trench No. 1 are zero (0 g/s). The WATER9 air emissions results for closed trench No. 5 are included in the emissions from Ditch 0 and the Splitter Box shown in Table A-8 of the October 2021 modeling report, as noted in footnote 1 to Table A-8.

4. Footnote 5, on Table A-8 provides the dimensions and area calculation for Ditch 0. This same footnote has been repeated starting with Table A-9 and thereafter and has not been corrected for the sources in those tables. Please revise to provide the correct source and dimensions for each table.

New-Indy Catawba Response 4: Footnotes have been corrected in Table A-9 through A-17 and provided in Attachment 2.

5. Regarding the SO2 modeling submitted in October 2021: Besides a slight increase in emissions for emission point FUTNCG1, are there any differences in the modeling compared to the SO2 modeling submitted in August 2021? If so, please provide a list of and reasons for the changes.

New-Indy Catawba Response 5: There are no differences in the August 2021 and October 2021 SO2 modeling other than the slight increase in SO2 emissions from source FUTNCG1.

Primary Clarifier –

6. Section 3.2 of the report narrative says "The July 2021 liquid sample results are coupled with the National Council for Air and Stream Improvement (NCASI) wastewater Hydrogen Sulfide Emissions Simulator (H2SSIM) emissions model for H2S emission [f]rom the primary clarifier and …" Please explain why inputs to the H2SSIM model changed from the August 2021 submittal – total sulfide, flow, temperature, pH, and length and width (diameter?) of clarifier.

New-Indy Catawba Response 6: In the August 2021 submittal, individual H2SSIM models were run for each day of the July 2021 IPT (conducted July 9-11, 2021). In the October 2021 submittal, one run using the average Flow, Temperature, and pH were used to estimate H¬¬¬2¬S emissions. The length and width of the clarifier were re-calculated as equivalent lengths and widths based on the surface area due to H2SSIM's inability to accommodate circular clarifiers. The total sulfide concentration was back-calculated using the WATER9 calculated removal efficiency (e.g., ASB influent concentration/removal efficiency).

7. Please explain why the modeled emission rate has increased from 2.07E-02 lb/hr to 1.63E-01 lb hr for H2S (and a similar change for the TRS emissions).

New-Indy Catawba Response 7: See Response 6 above for an explanation of the changes to the primary clarifier H2S emissions from the August 2021 submittal to the October 2021 modeling submittal. However, the primary clarifier H2S emissions have been re-calculated based on comments 8 and 9 in this document. The revised maximum emissions rate for H2S is 1.98E-03 lb/hr and 1.44E-01 lb/hr for TRS (as H2S). Table A-9 is provided in Attachment 2.

8. A pH of 9.08 was used in the Water9 runs for DMS, DMDS, and MM, but 8.943333 was used in the H2SSIM model. Why? Also, for Ditch 0, that follows the clarifier, a pH of 9.08 was used in the Water9 run for H2S.

New-Indy Catawba Response 8: The pH of 9.08 is sourced from the average readings of the Primary Clarifier pH PI tag from July 9-11, 2021. The pH of 8.943333 is the average ASB inlet pH from July 9-11, 2021, which was used as a surrogate until source specific data was available. Substituting the pH of 9.08 in H2SSIM results in a 27% decrease of H2S emissions from the primary clarifier (15.2 lb/yr vs. 11.1 lb/yr). No source specific pH data is available for Ditch 0, so the Ditch 0 pH is assumed equal to the primary clarifier. The corrected H2SSIM model for the Primary Clarifier is provided in Attachment 3.

9. Table A-9 – It appears the H2S rate, in g/s was not calculated correctly. A conversion from minutes to seconds was missed in the denominator, based on footnote 2. This will impact the TRS as H2S rates as well other calculations in this table. Please confirm correct emission rates throughout this table.

New-Indy Catawba Response 9: The conversion from hours to minutes and minutes to seconds have been included in the conversion calculation of H2S in g/s to H2S in lb/hr in Table A-9. The revised maximum emissions rate for H2S is 1.98E-03 lb/hr and 1.44E-01 for TRS (as H2S). Footnote 2 has also been updated to include the missing conversion. Table A-9 is provided in Attachment 2.

Aerated Stabilization Basin –

10. Slightly larger areas than those in the August report were used for each of the zones in the ASB in Table A-13. Please explain.

New-Indy Catawba Response 10: The actual water surface area of each ASB zone was determined from the aerial photo taken during the July 2021 IPT. The actual water surface area of each zone was converted to an equivalent length and width to use as an input to the WATER9 emissions model. The AERMOD polygons representing the areas of each ASB zone were harmonized with the areas for each zone in the WATER9 emissions model. The polygon area of each zone in AERMOD was made slightly larger than the area in the WATER9 emissions model as a conservative assumption. When the WATER9 emissions rates in g/cm2-s are applied to the AERMOD model areas, the total mass emissions are slightly overestimated in the AERMOD model. This change was made for consistency with responses to previous comments from DHEC and EPA related to the wastewater ditches in the model.

Holding Pond –

11. A smaller area has been used for the holding pond than that used in the August report. Please explain.

New-Indy Catawba Response 11: The AERMOD area of the holding pond was harmonized with the area in the WATER9 emissions model by correcting the north and west boundaries of the holding pond to represent the surface area in the WATER9 model. This change was made for consistency with responses to previous comments from DHEC and EPA related to the wastewater ditches in the model.

Post-Aeration Basin (Tank?) –

12. Were the stack tests performed on the Post-Aeration Basin approved by BAQ? The referenced test dates in Table A-7 are different from those that supplied data for the Initial Performance Test (IPT), where testing was done at the Post-Aeration Tank. How and from where was the source test data derived for this basin? Just to make sure, the IPT refers to this source as a tank. Is this the same as the Post-Aeration Basin?

New-Indy Catawba Response 12: The post aeration basin is a concrete tank. The post-aeration unit has been described as a basin or a tank at various times during its existence. The post-aeration basin (PAB) is an open top tank which was fitted with a cover and carbon absorption system to reduce the potential for H2S/TRS emissions. DHEC approved the temporary removal of the PAB cover for the duration of the July 2021 IPT wastewater sampling effort. Following the IPT, New-Indy Catawba purchased a Scentroid portable monitor for sampling H2S concentrations. The post-aeration basin stack tests were performed using the Scentroid portable monitor described in the New-Indy Catawba submittal on September 17, 2021 responding to DHEC comments on the August 2021 modeling report. The H2S concentrations measured at the outlet of the carbon absorption system during the July 2021 IPT represented the H2S emissions from the PAB at that time. Emissions measurements taken in September 2021 using the Scentroid portable monitor are more representative of actual H2S emissions from the PAB. Measuring the H2S concentrations at the outlet of the PAB carbon absorption system using the Scentroid portable monitor was not pre-approved by BAQ.

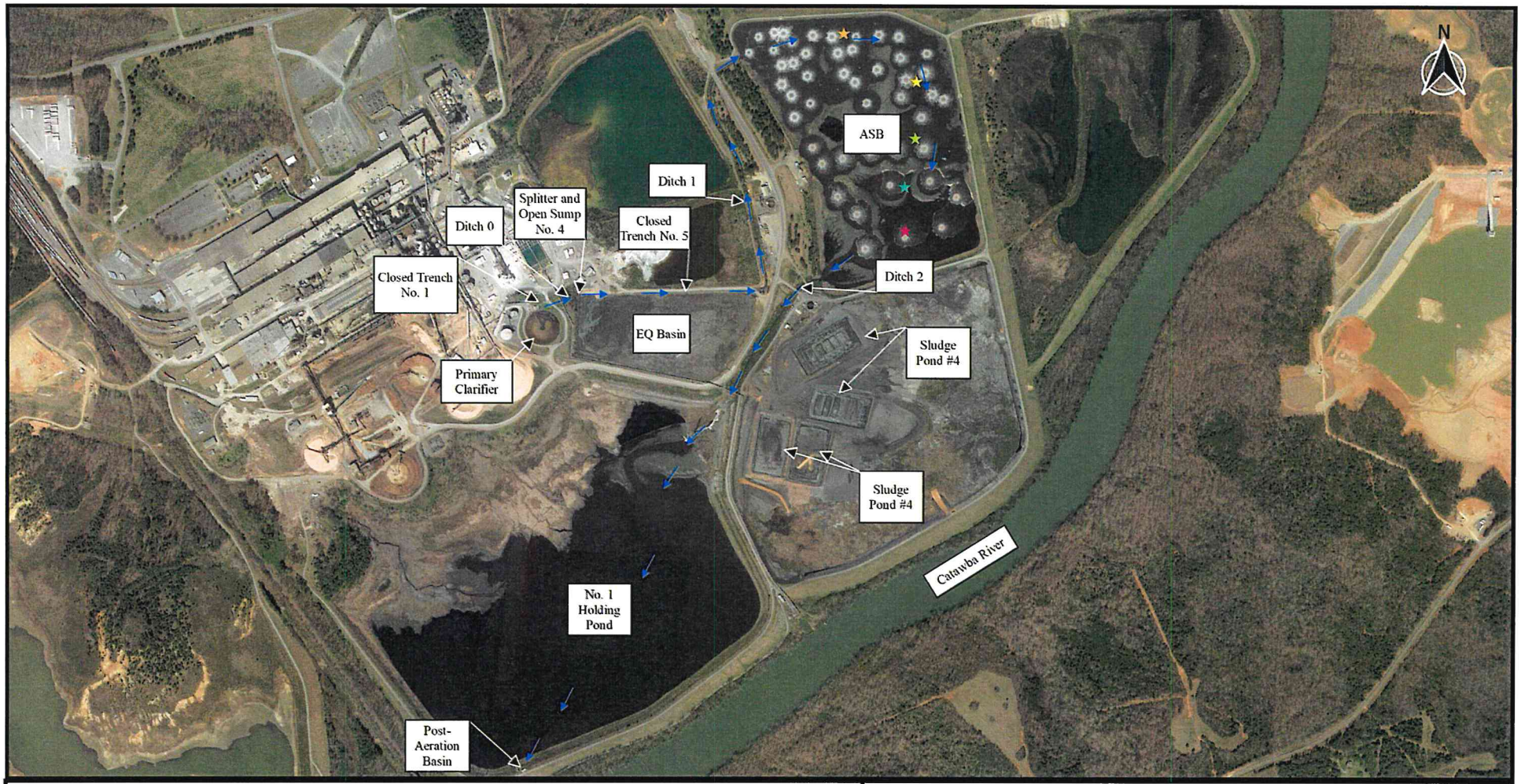
Please feel free to contact me via phone at 803-981-8010 or email at dan.mallett@new-indycb.com if you have any additional questions.

Sincerely,

Daniel J. Mallett
Environmental Manager

Enclosures

ATTACHMENT 1 – DRAWING



Legend

Wastewater Flow

0 1,000 2,000 3,000 4,000 ft

Figure 1
Wastewater Treatment Sources and Flow Direction

New-Indy Catawba
Catawba, SC

DRAWN BY:	CHECKED BY:	PROJECT NO.
A.K.	S.M.	00958-0010.00

ATTACHMENT 2 – CORRECTED TABLES

Table A-8

Ditch 0 + Splitter Box Water9 Model Results

New-Indy Catawba - Catawba, SC

DITCH 0 + SPLITTER BOX													
		ACTUAL								MAXIMUM			
	MW	g/s	Reference	Justification	sq meters[5]	g/s-sq meter[6]	lb/hr[7]	ODTP/day[8]	lb/ODTP[9]	ADTP/day[10]	lb/hr[11]	g/s[12]	g/s-sq meter[13]
H_2S	34.08	1.57E-05	WATER9, NCASI TB 1000[2]	WATER9 and Free Sulfide Tool	222.65	7.07E-08	1.25E-04	1553.08	1.93E-06	2700	1.95E-04	2.46E-05	1.11E-07
MM[1]	48.11	7.19E-05	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	222.65	3.23E-07	5.71E-04	1553.08	8.82E-06	2700	8.93E-04	1.12E-04	5.05E-07
DMS[1]	62.14	7.67E-03	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	222.65	3.44E-05	6.08E-02	1553.08	9.40E-04	2700	9.52E-02	1.20E-02	5.39E-05
DMDS[1]	94.20	1.47E-03	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	222.65	6.59E-06	1.16E-02	1553.08	1.80E-04	2700	1.82E-02	2.30E-03	1.03E-05
TRS (as H_2S)	34.08	5.33E-03	Summation[4]	Summation of H_2S, MM, DMS and DMDS converted to common H_2S basis based on molecular weight of sulfur in each constituent	222.65	2.40E-05	4.23E-02	1553.08	6.54E-04	2700	6.62E-02	8.34E-03	3.75E-05

[1] includes emissions from Ditch 0 (open from Primary Clarifier to Splitter Box), Splitter Box, and enclosed pipe from Splitter Box to Ditch 1

[2] H_2S emissions rate (g/s) calculated based on the site-specific liquid H_2S concentration from the July 9-11, 2021 initial performance test (IPT) under 40 CFR 63, Subpart S, adjusted for pH using the NCASI Free Sulfide Tool (as described in NCASI Technical Bulletin 1000, section 3.2), and the site-specific WATER9 program mass transfer coefficient for Ditch #0 + Splitter Box. Calculations of the fraction of H_2S and the H_2S emissions rate is provided in the attached spreadsheet Ditch #0 Calcs.xlsx. USEPA WATER9 Program, Version 3.0 is posted at: https://www3.epa.gov/ttnchie1/software/water/water9_3/index.html. The basis for the input values and the output files from the WATER9 Program are also attached.

[3] MM, DMS, and DMDS emissions rates (g/s) calculated based on site-specific MM, DMS, and DMDS liquid concentrations from the July 9-11, 2021 IPT and configuration of the Ditch #0 + Splitter Box utilizing the USEPA WATER9 Program, Version 3.0, posted at: https://www3.epa.gov/ttnchie1/software/water/water9_3/index.html. The basis for the input values and the output files from the WATER9 Program are also attached.

[4] 5.33E-03 g TRS/s = [(1.57E-05 g H2S/s x 32.07 mol S/g ÷ 34.08 mol H2S/g) + (7.19E-05 g MM/s x 32.07 mol S/g ÷ 48.11 mol MM/g) + (7.67E-03 g DMS/s x 32.07 mol S/g ÷ 62.14 mol DMS/g) + (1.47E-03 g DMDS/s x 64.14 mol S/g ÷ 94.20 mol DMDS/g)] x (34.08 mol H2S/g÷ 32.07 mol S/g)

[5] Ditch 0 is 3.65 meters wide and 61 meters long = 3.65 × 61 = 222.65 sq meters

[6] g TRS/s-sq meter = 5.33E-03 g TRS/s ÷ 222.65 sq meters = 2.40E-05 g TRS/s-sq meter

[7] lb TRS/hr = 5.33E-03 g TRS/s x 3600 s/hr ÷ 453.592 g TRS/lb TRS = 4.23E-02 lb TRS/hr

[8] average pulp production during sampling on July 9, 10 and 11 (1694.16, 1609.17, 1355.92 ODTP/day)

[9] lb TRS/ODTP = 4.23E-02 lb TRS/hr x 1 hr/1553.08 ODTP = 6.54E-04 lb TRS/ODTP

[10] maximum production from June 2019 and April 2020 Project Columbia construction permit applications (construction permit DF)

[11] lb TRS/hr = 6.54E-04 lb TRS/ODTP x 2700 ADTP/day x 1 day/24 hr x 0.9 ODTP/1.0 ADTP = 6.62E-02 lb TRS/hr

[12] g TRS/s = 6.62E-02 lb TRS/hr x 453.592 g TRS/lb TRSx 1 hr/3600 s = 8.34E-03 g TRS/s

[13] g TRS/s-sq meter = 8.34E-03 g TRS/s ÷ 222.65 sq meters = 3.75E-05 g TRS/s-sq meter

Table A-9
Primary Clarifier Water9 Model Results
New-Indy Catawba - Catawba, SC

PRIMARY CLARIFIER													
		ACTUAL								MAXIMUM			
	MW	g/s	Reference	Justification	sq meters[5]	g/s-sq meter[6]	lb/hr[7]	ODTP/day[8]	lb/ODTP[9]	ADTP/day[10]	lb/hr[11]	g/s[12]	g/s-sq meter[13]
H_2S	34.08	1.60E-04	H2SSIM[2]	National Council for Air and Stream Improvement (NCASI) model for pulp and paper biological wastewater system H_2S emissions	5542	2.88E-08	1.27E-03	1553.08	1.96E-05	2700	1.98E-03	2.50E-04	4.51E-08
MM	48.11	1.40E-04	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	5542	2.53E-08	1.11E-03	1553.08	1.72E-05	2700	1.74E-03	2.20E-04	3.96E-08
DMS	62.14	1.63E-02	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	5542	2.94E-06	1.29E-01	1553.08	2.00E-03	2700	2.02E-01	2.55E-02	4.59E-06
DMDS	94.20	3.36E-03	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	5542	6.06E-07	2.67E-02	1553.08	4.12E-04	2700	4.17E-02	5.26E-03	9.49E-07
TRS (as H_2S)	34.08	1.16E-02	Summation[4]	Summation of H_2S, MM, DMS and DMDS converted to common H_2S basis based on molecular weight of sulfur in each constituent	5542	2.10E-06	9.22E-02	1553.08	1.42E-03	2700	1.44E-01	1.82E-02	3.28E-06

[1] Reserved.

[2] H2SSIM model results for wastewater samples collected on July 9, July 10 and July 11 (11.1 lb/yr) during the 40 CFR 63, Subpart S IPT converted to grams per second [11.1 lb/yr * 453.592 grams/lb / (8760 hrs/yr * 60 min/hr * 60 s/min)]. The NCASI H2SSIM model that calculates the sulfide fate and transport in wastewater treatment basins is documented in NCASI TB 1000. Input and output files from the H2SSIM model are attached.

[3] Average of WATER9 model results for wastewater samples collected on July 9, July 10 and July 11 during the 40 CFR 63, Subpart S IPT. USEPA WATER9 Program, Version 3.0, posted at: https://www3.epa.gov/ttnchie1/software/water/water9_3/index.html. The basis for the input values and the output files from the WATER9 Program are also attached.

[4] 1.16E-02 g TRS/s = [(1.60E-04 g H2S/s x 32.07 mol S/g ÷ 34.08 mol H2S/g) + (1.40E-04 g MM/s x 32.07 mol S/g ÷ 48.11 mol MM/g) + (1.63E-02 g DMS/s x 32.07 mol S/g ÷ 62.14 mol DMS/g) + (3.36E-03 g DMDS/s x 64.14 mol S/g ÷ 94.20 mol DMDS/g)] x (34.08 mol H2S/g÷ 32.07 mol S/g)

[5] Primary Clarifier is 84 meters in diameter = 3.14 x (84/2)^2 = 5,542 sq meters

[6] g TRS/s-sq meter = 1.16E-02 g TRS/s ÷ 5542 sq meters = 2.10E-06 g TRS/s-sq meter

[7] lb TRS/hr = 1.16E-02 g TRS/s x 3600 s/hr ÷ 453.592 g TRS/lb TRS = 9.22E-02 lb TRS/hr

[8] average pulp production during sampling on July 9, 10 and 11 (1694.16, 1609.17, 1355.92 ODTP/day)

[9] lb TRS/ODTP = 9.22E-02 lb TRS/hr x 1 hr/1553.08 ODTP = 1.42E-03 lb TRS/ODTP

[10] maximum production from June 2019 and April 2020 Project Columbia construction permit applications (construction permit DF)

[11] lb TRS/hr = 1.42E-03 lb TRS/ODTP x 2700 ADTP/day x 1 day/24 hr x 0.9 ODTP/1.0 ADTP = 1.44E-01 lb TRS/hr

[12] g TRS/s = 1.44E-01 lb TRS/hr x 453.592 g TRS/lb TRSx 1 hr/3600 s = 1.82E-02 g TRS/s

[13] g TRS/s-sq meter = 1.82E-02 g TRS/s ÷ 5542 sq meters = 3.28E-06 g TRS/s-sq meter

Table A-10
Equalization Basin Water9 Model Results
New-Indy Catawba - Catawba, SC

EQUALIZATION BASIN[1]													
		ACTUAL								MAXIMUM			
	MW	g/s	Reference	Justification	sq meters[5]	g/s-sq meter[6]	lb/hr[7]	ODTP/day[8]	lb/ODTP[9]	ADTP/day[10]	lb/hr[11]	g/s[12]	g/s-sq meter[13]
H_2S	34.08	4.56E-03	NCASI Form R and TB 956 and 1000[2]	NCASI Toxics Release Inventory (TRI) Form R Guidance and Free Sulfide Tool	7616	5.99E-07	3.62E-02	1553.08	5.59E-04	2700	5.66E-02	7.14E-03	9.37E-07
MM[3]	48.11												
DMS[3]	62.14												
DMDS[3]	94.20												
TRS (as H_2S)	34.08	4.56E-03	Summation[4]	Summation of H_2S, MM, DMS and DMDS converted to common H_2S basis based on molecular weight of sulfur in each constituent	7616	5.99E-07	3.62E-02	1553.08	5.59E-04	2700	5.66E-02	7.14E-03	9.37E-07

[1] Equalization Basin area includes open channel along northern edge between open surface area on western side to Ditch 1 on eastern side

[2] NCASI Handbook of Chemical-Specific Information for Superfund Amendments and Reauthorization Act (SARA) Section 313 Form R Reporting - Pulp and Paper Facilities. Hydrogen Sulfide, Table 4 "WWTP PARTITIONING AND EMISSIONS OF HYDROGEN SULFIDE", Sludge Pond mean emissions factor of 4.2 lb/(day-Acre). H_2S emissions factor adjusted for pH using the NCASI Free Sulfide Tool (as described in NCASI Technical Bulletin 1000, section 3.2) and documentation of the emissions rate calculation is provided in the attached spreadsheet "EQ Basin and Sludge Lagoon Calcs.xlsx".

[3] There are no emissions of MM, DMS, and DMDS reported from the equalization basin. Small amounts of MM, DMS, and DMDS that are contained in the water that remains with the sludge from the primary clarifier that is deposited in the equalization basin are assumed to be emitted in the primary clarifier, ditch #0, #1, and #2, or Aerated Stabilization Basin (ASB) Zones 1-3.

[4] 4.56E-03 g TRS/s = [(4.56E-03 g H2S/s x 32.07 mol S/g ÷ 34.08 mol H2S/g) + (0.00E+00 g MM/s x 32.07 mol S/g ÷ 48.11 mol MM/g) + (0.00E+00 g DMS/s x 32.07 mol S/g ÷ 62.14 mol DMS/g) + (0.00E+00 g DMDS/s x 64.14 mol S/g ÷ 94.20 mol DMDS/g)] x (34.08 mol H2S/g÷ 32.07 mol S

[5] Equalization Basin free water surface area calculated using Geographic Information System (GIS) software.

[6] g TRS/s-sq meter = 4.56E-03 g TRS/s ÷ 7616 sq meters = 5.99E-07 g TRS/s-sq meter

[7] lb TRS/hr = 4.56E-03 g TRS/s x 3600 s/hr ÷ 453.592 g TRS/lb TRS = 3.62E-02 lb TRS/hr

[8] average pulp production during sampling on July 9, 10 and 11 (1694.16, 1609.17, 1355.92 ODTP/day)

[9] lb TRS/ODTP = 3.62E-02 lb TRS/hr x 1 hr/1553.08 ODTP = 5.59E-04 lb TRS/ODTP

[10] maximum production from June 2019 and April 2020 Project Columbia construction permit applications (construction permit DF)

[11] lb TRS/hr = 5.59E-04 lb TRS/ODTP x 2700 ADTP/day x 1 day/24 hr x 0.9 ODTP/1.0 ADTP = 5.66E-02 lb TRS/hr

[12] g TRS/s = 5.66E-02 lb TRS/hr x 453.592 g TRS/lb TRSx 1 hr/3600 s = 7.14E-03 g TRS/s

[13] g TRS/s-sq meter = 7.14E-03 g TRS/s ÷ 7616 sq meters = 9.37E-07 g TRS/s-sq meter

Table A-11
Ditch #1 Water9 Model Results
New-Indy Catawba - Catawba, SC

DITCH 1													
		ACTUAL								MAXIMUM			
	MW	g/s	Reference	Justification	sq meters[5]	g/s-sq meter[6]	lb/hr[7]	ODTP/day[8]	lb/ODTP[9]	ADTP/day[10]	lb/hr[11]	g/s[12]	g/s-sq meter[13]
H_2S	34.08	2.10E-04	WATER9, NCASI TB 1000[2]	WATER9 and Free Sulfide Tool	2190	9.57E-08	1.66E-03	1553.08	2.57E-05	2700	2.60E-03	3.28E-04	1.50E-07
MM	48.11	4.50E-04	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	2190	2.05E-07	3.57E-03	1553.08	5.51E-05	2700	5.58E-03	7.03E-04	3.21E-07
DMS	62.14	5.04E-02	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	2190	2.30E-05	4.00E-01	1553.08	6.18E-03	2700	6.26E-01	7.88E-02	3.60E-05
DMDS	94.20	1.09E-02	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	2190	4.99E-06	8.68E-02	1553.08	1.34E-03	2700	1.36E-01	1.71E-02	7.81E-06
TRS (as H_2S)	34.08	3.61E-02	Summation[4]	Summation of H_2S, MM, DMS and DMDS converted to common H_2S basis based on molecular weight of sulfur in each constituent	2190	1.65E-05	2.86E-01	1553.08	4.43E-03	2700	4.48E-01	5.65E-02	2.58E-05

[1] Reserved.

[2] H_2S emissions rate (g/s) calculated based on the site-specific liquid H_2S concentration from the July 9-11, 2021 initial performance test (IPT) under 40 CFR 63, Subpart S, adjusted for pH using the NCASI Free Sulfide Tool (as described in NCASI Technical Bulletin 1000, section 3.2), and the site-specific WATER9 program mass transfer coefficient for Ditch #1. Calculations of the fraction of H_2S and the H_2S emissions rate is provided in the attached spreadsheet Ditch #1 Calcs.xlsx. USEPA WATER9 Program, Version 3.0 is posted at: https://www3.epa.gov/ttnchie1/software/water/water9_3/index.html. The basis for the input values and the output files from the WATER9 Program are also attached.

[3] MM, DMS, and DMDS emissions rates (g/s) calculated based on site-specific MM, DMS, and DMDS liquid concentrations from the July 9-11, 2021 IPT and configuration of the Ditch #1 utilizing the USEPA WATER9 Program, Version 3.0, posted at: https://www3.epa.gov/ttnchie1/software/water/water9_3/index.html. The basis for the input values and the output files from the WATER9 Program are also attached.

[4] 3.61E-02 g TRS/s = [(2.10E-04 g H2S/s x 32.07 mol S/g ÷ 34.08 mol H2S/g) + (4.50E-04 g MM/s x 32.07 mol S/g ÷ 48.11 mol MM/g) + (5.04E-02 g DMS/s x 32.07 mol S/g ÷ 62.14 mol DMS/g) + (1.09E-02 g DMDS/s x 64.14 mol S/g ÷ 94.20 mol DMDS/g)] x (34.08 mol H2S/g÷ 32.07 mol S/g)

[5] Ditch 1 is 3.65 meters wide and 600 meters long = 3.65 × 600 = 2,190 sq meters

[6] g TRS/s-sq meter = 3.61E-02 g TRS/s ÷ 2190 sq meters = 1.65E-05 g TRS/s-sq meter

[7] lb TRS/hr = 3.61E-02 g TRS/s x 3600 s/hr ÷ 453.592 g TRS/lb TRS = 2.86E-01 lb TRS/hr

[8] average pulp production during sampling on July 9, 10 and 11 (1694.16, 1609.17, 1355.92 ODTP/day)

[9] lb TRS/ODTP = 2.86E-01 lb TRS/hr x 1 hr/1553.08 ODTP = 4.43E-03 lb TRS/ODTP

[10] maximum production from June 2019 and April 2020 Project Columbia construction permit applications (construction permit DF)

[11] lb TRS/hr = 4.43E-03 lb TRS/ODTP x 2700 ADTP/day x 1 day/24 hr x 0.9 ODTP/1.0 ADTP = 4.48E-01 lb TRS/hr

[12] g TRS/s = 4.48E-01 lb TRS/hr x 453.592 g TRS/lb TRSx 1 hr/3600 s = 5.65E-02 g TRS/s

[13] g TRS/s-sq meter = 5.65E-02 g TRS/s ÷ 2190 sq meters = 2.58E-05 g TRS/s-sq meter

Table A-12

Aerated Stabilization Basin - Zone 1 - Water9 Model Results

New-Indy Catawba - Catawba, SC

AERATED STABILIZATION BASIN - ZONE 1													
		ACTUAL								MAXIMUM			
	MW	g/s	Reference	Justification	sq meters[5]	g/s-sq meter[6]	lb/hr[7]	ODTP/day[8]	lb/ODTP[9]	ADTP/day[10]	lb/hr[11]	g/s[12]	g/s-sq meter[13]
H_2S	34.08	5.20E-02	H2SSIM[2]	National Council for Air and Stream Improvement (NCASI) model for pulp and paper biological wastewater system H_2S emissions	50625	1.03E-06	4.13E-01	1553.08	6.38E-03	2700	6.46E-01	8.14E-02	1.61E-06
MM	48.11	4.44E-02	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	50625	8.77E-07	3.52E-01	1553.08	5.44E-03	2700	5.51E-01	6.94E-02	1.37E-06
DMS	62.14	8.00E-02	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	50625	1.58E-06	6.35E-01	1553.08	9.81E-03	2700	9.93E-01	1.25E-01	2.47E-06
DMDS	94.20	3.96E-02	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	50625	7.82E-07	3.14E-01	1553.08	4.85E-03	2700	4.91E-01	6.19E-02	1.22E-06
TRS (as H_2S)	34.08	1.56E-01	Summation[4]	Summation of H_2S, MM, DMS and DMDS converted to common H_2S basis based on molecular weight of sulfur in each constituent	50625	3.08E-06	1.24E+00	1553.08	1.91E-02	2700	1.94E+00	2.44E-01	4.82E-06

[1] Reserved.

[2] Average of H2SSIM model results for Zone 1 ASB wastewater samples collected on July 9, July 10 and July 11 (0.0240 g/s, 0.0770 g/s, 0.0550 g/s) during the 40 CFR 63, Subpart S IPT. The NCASI H2SSIM model that calculates the sulfide fate and transport in wastewater treatment basins is documented in NCASI TB 1000. Input and output files from the H2SSIM model are attached.

[3] Average of WATER9 model results for Zone 1 ASB wastewater samples collected on July 9, July 10 and July 11 during the 40 CFR 63, Subpart S IPT. USEPA WATER9 Program, Version 3.0, posted at: https://www3.epa.gov/ttnchie1/software/water/water9_3/index.html. The basis for the input values and the output files from the WATER9 Program are also attached.

[4] 1.56E-01 g TRS/s = [(5.20E-02 g H2S/s x 32.07 mol S/g ÷ 34.08 mol H2S/g) + (4.44E-02 g MM/s x 32.07 mol S/g ÷ 48.11 mol MM/g) + (8.00E-02 g DMS/s x 32.07 mol S/g ÷ 62.14 mol DMS/g) + (3.96E-02 g DMDS/s x 64.14 mol S/g ÷ 94.20 mol DMDS/g)] x (34.08 mol H2S/g÷ 32.07 mol S/g)

[5] ASB Zone 1 is 225 meters wide and 225 meters long = 225 × 225 = 50,625 sq meters

[6] g TRS/s-sq meter = 1.56E-01 g TRS/s ÷ 50625 sq meters = 3.08E-06 g TRS/s-sq meter

[7] lb TRS/hr = 1.56E-01 g TRS/s x 3600 s/hr ÷ 453.592 g TRS/lb TRS = 1.24E+00 lb TRS/hr

[8] average pulp production during sampling on July 9, 10 and 11 (1694.16, 1609.17, 1355.92 ODTP/day)

[9] lb TRS/ODTP = 1.24E+00 lb TRS/hr x 1 hr/1553.08 ODTP = 1.91E-02 lb TRS/ODTP

[10] maximum production from June 2019 and April 2020 Project Columbia construction permit applications (construction permit DF)

[11] lb TRS/hr = 1.91E-02 lb TRS/ODTP x 2700 ADTP/day x 1 day/24 hr x 0.9 ODTP/1.0 ADTP = 1.94E+00 lb TRS/hr

[12] g TRS/s = 1.94E+00 lb TRS/hr x 453.592 g TRS/lb TRSx 1 hr/3600 s = 2.44E-01 g TRS/s

[13] g TRS/s-sq meter = 2.44E-01 g TRS/s ÷ 50625 sq meters = 4.82E-06 g TRS/s-sq meter

Table A-13
Aerated Stabilization Basin - Zone 2 - Water9 Model Results
New-Indy Catawba - Catawba, SC

AERATED STABILIZATION BASIN - ZONE 2													
		ACTUAL								MAXIMUM			
	MW	g/s	Reference	Justification	sq meters[5]	g/s-sq meter[6]	lb/hr[7]	ODTP/day[8]	lb/ODTP[9]	ADTP/day[10]	lb/hr[11]	g/s[12]	g/s-sq meter[13]
H_2S	34.08	4.00E-02	H2SSIM[2]	National Council for Air and Stream Improvement (NCASI) model for pulp and paper biological wastewater system H_2S emissions	66540	6.01E-07	3.17E-01	1553.08	4.91E-03	2700	4.97E-01	6.26E-02	9.41E-07
MM	48.11	1.26E-03	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	66540	1.90E-08	1.00E-02	1553.08	1.55E-04	2700	1.57E-02	1.98E-03	2.97E-08
DMS	62.14	2.66E-03	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	66540	4.00E-08	2.11E-02	1553.08	3.26E-04	2700	3.30E-02	4.16E-03	6.26E-08
DMDS	94.20	9.94E-04	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	66540	1.49E-08	7.89E-03	1553.08	1.22E-04	2700	1.23E-02	1.56E-03	2.34E-08
TRS (as H_2S)	34.08	4.31E-02	Summation[4]	Summation of H_2S, MM, DMS and DMDS converted to common H_2S basis based on molecular weight of sulfur in each constituent	66540	6.47E-07	3.42E-01	1553.08	5.28E-03	2700	5.35E-01	6.74E-02	1.01E-06

[1] Reserved.

[2] Average of H2SSIM model results for Zone 2 ASB wastewater samples collected on July 9, July 10 and July 11 (0.0250 g/s, 0.0430 g/s, 0.0520 g/s) during the 40 CFR 63, Subpart S IPT. The NCASI H2SSIM model that calculates the sulfide fate and transport in wastewater treatment basins is documented in NCASI TB 1000. Input and output files from the H2SSIM model are attached.

[3] Average of WATER9 model results for Zone 2 ASB wastewater samples collected on July 9, July 10 and July 11 during the 40 CFR 63, Subpart S IPT. USEPA WATER9 Program, Version 3.0, posted at: https://www3.epa.gov/ttnchie1/software/water/water9_3/index.html. The basis for the input values and the output files from the WATER9 Program are also attached.

[4] 4.31E-02 g TRS/s = [(4.00E-02 g H2S/s x 32.07 mol S/g ÷ 34.08 mol H2S/g) + (1.26E-03 g MM/s x 32.07 mol S/g ÷ 48.11 mol MM/g) + (2.66E-03 g DMS/s x 32.07 mol S/g ÷ 62.14 mol DMS/g) + (9.94E-04 g DMDS/s x 64.14 mol S/g ÷ 94.20 mol DMDS/g)] x (34.08 mol H2S/g÷ 32.07 mol S/g)

[5] ASB Zone 2 is 365 meters wide and 182.3 meters long = 365 × 182.3 = 66,540 sq meters

[6] g TRS/s-sq meter = 4.31E-02 g TRS/s ÷ 66539.5 sq meters = 6.47E-07 g TRS/s-sq meter

[7] lb TRS/hr = 4.31E-02 g TRS/s x 3600 s/hr ÷ 453.592 g TRS/lb TRS = 3.42E-01 lb TRS/hr

[8] average pulp production during sampling on July 9, 10 and 11 (1694.16, 1609.17, 1355.92 ODTP/day)

[9] lb TRS/ODTP = 3.42E-01 lb TRS/hr x 1 hr/1553.08 ODTP = 5.28E-03 lb TRS/ODTP

[10] maximum production from June 2019 and April 2020 Project Columbia construction permit applications (construction permit DF)

[11] lb TRS/hr = 5.28E-03 lb TRS/ODTP x 2700 ADTP/day x 1 day/24 hr x 0.9 ODTP/1.0 ADTP = 5.35E-01 lb TRS/hr

[12] g TRS/s = 5.35E-01 lb TRS/hr x 453.592 g TRS/lb TRSx 1 hr/3600 s = 6.74E-02 g TRS/s

[13] g TRS/s-sq meter = 6.74E-02 g TRS/s ÷ 66539.5 sq meters = 1.01E-06 g TRS/s-sq meter

Table A-14
Aerated Stabilization Basin - Zone 3 - Water9 Model Results
New-Indy Catawba - Catawba, SC

AERATED STABILIZATION BASIN - ZONE 3													
		ACTUAL								MAXIMUM			
	MW	g/s	Reference	Justification	sq meters[5]	g/s-sq meter[6]	lb/hr[7]	ODTP/day[8]	lb/ODTP[9]	ADTP/day[10]	lb/hr[11]	g/s[12]	g/s-sq meter[13]
H_2S	34.08	2.40E-02	H2SSIM[2]	National Council for Air and Stream Improvement (NCASI) model for pulp and paper biological wastewater system H_2S emissions	72352	3.32E-07	1.90E-01	1553.08	2.94E-03	2700	2.98E-01	3.76E-02	5.19E-07
MM	48.11	3.48E-05	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	72352	4.80E-10	2.76E-04	1553.08	4.26E-06	2700	4.32E-04	5.44E-05	7.51E-10
DMS	62.14	7.81E-05	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	72352	1.08E-09	6.20E-04	1553.08	9.58E-06	2700	9.70E-04	1.22E-04	1.69E-09
DMDS	94.20	1.55E-05	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	72352	2.14E-10	1.23E-04	1553.08	1.90E-06	2700	1.92E-04	2.42E-05	3.34E-10
TRS (as H_2S)	34.08	2.41E-02	Summation[4]	Summation of H_2S, MM, DMS and DMDS converted to common H_2S basis based on molecular weight of sulfur in each constituent	72352	3.33E-07	1.91E-01	1553.08	2.95E-03	2700	2.99E-01	3.77E-02	5.21E-07

[1] Reserved.

[2] Average of H2SSIM model results for Zone 3 ASB wastewater samples collected on July 9, July 10 and July 11 (0.0230 g/s, 0.0230 g/s, 0.0260 g/s) during the 40 CFR 63, Subpart S IPT. The NCASI H2SSIM model that calculates the sulfide fate and transport in wastewater treatment basins is documented in NCASI TB 1000. Input and output files from the H2SSIM model are attached.

[3] Average of WATER9 model results for Zone 3 ASB wastewater samples collected on July 9, July 10 and July 11 during the 40 CFR 63, Subpart S IPT. USEPA WATER9 Program, Version 3.0, posted at: https://www3.epa.gov/ttnchie1/software/water/water9_3/index.html. The basis for the input values and the output files from the WATER9 Program are also attached.

[4] 2.41E-02 g TRS/s = [(2.40E-02 g H2S/s x 32.07 mol S/g ÷ 34.08 mol H2S/g) + (3.48E-05 g MM/s x 32.07 mol S/g ÷ 48.11 mol MM/g) + (7.81E-05 g DMS/s x 32.07 mol S/g ÷ 62.14 mol DMS/g) + (1.55E-05 g DMDS/s x 64.14 mol S/g ÷ 94.20 mol DMDS/g)] x (34.08 mol H2S/g÷ 32.07 mol S/g)

[5] ASB Zone 3 is 380.4 meters wide and 190.2 meters long = 380.4 × 190.2 = 72,352 sq meters

[6] g TRS/s-sq meter = 2.41E-02 g TRS/s ÷ 72352.08 sq meters = 3.33E-07 g TRS/s-sq meter

[7] lb TRS/hr = 2.41E-02 g TRS/s x 3600 s/hr ÷ 453.592 g TRS/lb TRS = 1.91E-01 lb TRS/hr

[8] average pulp production during sampling on July 9, 10 and 11 (1694.16, 1609.17, 1355.92 ODTP/day)

[9] lb TRS/ODTP = 1.91E-01 lb TRS/hr x 1 hr/1553.08 ODTP = 2.95E-03 lb TRS/ODTP

[10] maximum production from June 2019 and April 2020 Project Columbia construction permit applications (construction permit DF)

[11] lb TRS/hr = 2.95E-03 lb TRS/ODTP x 2700 ADTP/day x 1 day/24 hr x 0.9 ODTP/1.0 ADTP = 2.99E-01 lb TRS/hr

[12] g TRS/s = 2.99E-01 lb TRS/hr x 453.592 g TRS/lb TRSx 1 hr/3600 s = 3.77E-02 g TRS/s

[13] g TRS/s-sq meter = 3.77E-02 g TRS/s ÷ 72352.08 sq meters = 5.21E-07 g TRS/s-sq meter

Table A-15
Ditch #2 - Water9 Model Results
New-Indy Catawba - Catawba, SC

DITCH 2													
		ACTUAL								MAXIMUM			
	MW	g/s	Reference	Justification	sq meters[5]	g/s-sq meter[6]	lb/hr[7]	ODTP/day[8]	lb/ODTP[9]	ADTP/day[10]	lb/hr[11]	g/s[12]	g/s-sq meter[13]
H_2S	34.08	1.56E-03	WATER9, NCASI TB 1000[2]	WATER9 and Free Sulfide Tool	1825	8.57E-07	1.24E-02	1553.08	1.92E-04	2700	1.94E-02	2.45E-03	1.34E-06
MM	48.11	3.69E-04	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	1825	2.02E-07	2.93E-03	1553.08	4.53E-05	2700	4.59E-03	5.78E-04	3.17E-07
DMS	62.14	1.67E-03	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	1825	9.13E-07	1.32E-02	1553.08	2.04E-04	2700	2.07E-02	2.61E-03	1.43E-06
DMDS	94.20	4.48E-04	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	1825	2.46E-07	3.56E-03	1553.08	5.50E-05	2700	5.57E-03	7.02E-04	3.84E-07
TRS (as H_2S)	34.08	3.06E-03	Summation[4]	Summation of H_2S, MM, DMS and DMDS converted to common H_2S basis based on molecular weight of sulfur in each constituent	1825	1.68E-06	2.43E-02	1553.08	3.76E-04	2700	3.80E-02	4.79E-03	2.63E-06

[1] Reserved.

[2] H_2S emissions rate (g/s) calculated based on the site-specific liquid H_2S concentration outlet calculated from Zone 3 ASB H2SSIMS, adjusted for pH using the NCASI Free Sulfide Tool (as described in NCASI Technical Bulletin 1000, section 3.2), and the site-specific WATER9 program mass transfer coefficient for Ditch #2. Calculations of the fraction of H_2S and the H_2S emissions rate is provided in the attached spreadsheet Ditch #2 Calcs.xlsx. USEPA WATER9 Program, Version 3.0 is posted at: https://www3.epa.gov/ttnchie1/software/water/water9_3/index.html. The basis for the input values and the output files from the WATER9 Program are also attached.

[3] MM, DMS, and DMDS emissions rates (g/s) calculated based on site-specific MM, DMS, and DMDS liquid concentrations from the July 9-11, 2021 IPT and configuration of the Ditch #2 utilizing the USEPA WATER9 Program, Version 3.0, posted at: https://www3.epa.gov/ttnchie1/software/water/water9_3/index.html. The basis for the input values and the output files from the WATER9 Program are also attached.

[4] 3.06E-03 g TRS/s = [(1.56E-03 g H2S/s x 32.07 mol S/g ÷ 34.08 mol H2S/g) + (3.69E-04 g MM/s x 32.07 mol S/g ÷ 48.11 mol MM/g) + (1.67E-03 g DMS/s x 32.07 mol S/g ÷ 62.14 mol DMS/g) + (4.48E-04 g DMDS/s x 64.14 mol S/g ÷ 94.20 mol DMDS/g)] x (34.08 mol H2S/g÷ 32.07 mol S/g)

[5] Ditch 2 is 3.65 meters wide and 500 meters long = 3.65 × 500 = 1,825 sq meters

[6] g TRS/s-sq meter = 3.06E-03 g TRS/s ÷ 1825 sq meters = 1.68E-06 g TRS/s-sq meter

[7] lb TRS/hr = 3.06E-03 g TRS/s x 3600 s/hr ÷ 453.592 g TRS/lb TRS = 2.43E-02 lb TRS/hr

[8] average pulp production during sampling on July 9, 10 and 11 (1694.16, 1609.17, 1355.92 ODTP/day)

[9] lb TRS/ODTP = 2.43E-02 lb TRS/hr x 1 hr/1553.08 ODTP = 3.76E-04 lb TRS/ODTP

[10] maximum production from June 2019 and April 2020 Project Columbia construction permit applications (construction permit DF)

[11] lb TRS/hr = 3.76E-04 lb TRS/ODTP x 2700 ADTP/day x 1 day/24 hr x 0.9 ODTP/1.0 ADTP = 3.80E-02 lb TRS/hr

[12] g TRS/s = 3.80E-02 lb TRS/hr x 453.592 g TRS/lb TRSx 1 hr/3600 s = 4.79E-03 g TRS/s

[13] g TRS/s-sq meter = 4.79E-03 g TRS/s ÷ 1825 sq meters = 2.63E-06 g TRS/s-sq meter

Table A-16
Holding Pond - Water9 Model Results
New-Indy Catawba - Catawba, SC

HOLDING POND													
		ACTUAL								MAXIMUM			
	MW	g/s	Reference	Justification	sq meters[5]	g/s-sq meter[6]	lb/hr[7]	ODTP/day[8]	lb/ODTP[9]	ADTP/day[10]	lb/hr[11]	g/s[12]	g/s-sq meter[13]
H_2S	34.08	4.00E-02	NCASI TB956[1]	Consistent with emissions from ASB Zones 2 and 3. See also Footnote 1.	388550	1.03E-07	3.17E-01	1553.08	4.91E-03	2700	4.97E-01	6.26E-02	1.61E-07
MM	48.11	1.54E-05	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	388550	3.96E-11	1.22E-04	1553.08	1.89E-06	2700	1.91E-04	2.41E-05	6.20E-11
DMS	62.14	4.82E-05	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	388550	1.24E-10	3.83E-04	1553.08	5.91E-06	2700	5.99E-04	7.54E-05	1.94E-10
DMDS	94.20	3.89E-06	WATER9[3]	USEPA Emissions Model for Wastewater Treatment Plants	388550	1.00E-11	3.09E-05	1553.08	4.77E-07	2700	4.83E-05	6.08E-06	1.57E-11
TRS (as H_2S)	34.08	4.00E-02	Summation[4]	Summation of H_2S, MM, DMS and DMDS converted to common H_2S basis based on molecular weight of sulfur in each constituent	388550	1.03E-07	3.18E-01	1553.08	4.91E-03	2700	4.97E-01	6.26E-02	1.61E-07

[1] The H2SSIM model was not calibrated for post-aeration basins. However, eleven post-aeration basins (i.e., holding or retention ponds) were tested as part of the NC study published in NCASI TB 956. Two of the eleven post-aeration basins resulted in reported H_2S emissions (all others were not significant based on the screening study results). Based on the stie-specific H2SSIM Model results for New-Indy, worst-case emissions are assumed to be equal to Mill B reported H_2S emissions (0.04 g/s). This H_2S rate is consistent with Zones 2 and 3 H_2S emissions rates and emissions would not expect to be higher than these rates as the Holding Pond is aerated with dissolved oxygen levels at an average of 1.1 across the holding pond during the test (Note: anoxic conditions occur when dissolved oxygen levels near zero per NCASI TB 1000).

[2] Reserved.

[3] Reserved.

[4] 4.00E-02 g TRS/s = [(4.00E-02 g H2S/s x 32.07 mol S/g ÷ 34.08 mol H2S/g) + (1.54E-05 g MM/s x 32.07 mol S/g ÷ 48.11 mol MM/g) + (4.82E-05 g DMS/s x 32.07 mol S/g ÷ 62.14 mol DMS/g) + (3.89E-06 g DMDS/s x 64.14 mol S/g ÷ 94.20 mol DMDS/g)] x (34.08 mol H2S/g÷ 32.07 mol S/g)

[5] Holding Pond is 818 meters wide and 475 meters long = 818 × 475 = 388,550 sq meters

[6] g TRS/s-sq meter = 4.00E-02 g TRS/s ÷ 388550 sq meters = 1.03E-07 g TRS/s-sq meter

[7] lb TRS/hr = 4.00E-02 g TRS/s x 3600 s/hr ÷ 453.592 g TRS/lb TRS = 3.18E-01 lb TRS/hr

[8] average pulp production during sampling on July 9, 10 and 11 (1694.16, 1609.17, 1355.92 ODTP/day)

[9] lb TRS/ODTP = 3.18E-01 lb TRS/hr x 1 hr/1553.08 ODTP = 4.91E-03 lb TRS/ODTP

[10] maximum production from June 2019 and April 2020 Project Columbia construction permit applications (construction permit DF)

[11] lb TRS/hr = 4.91E-03 lb TRS/ODTP x 2700 ADTP/day x 1 day/24 hr x 0.9 ODTP/1.0 ADTP = 4.97E-01 lb TRS/hr

[12] g TRS/s = 4.97E-01 lb TRS/hr x 453.592 g TRS/lb TRSx 1 hr/3600 s = 6.26E-02 g TRS/s

[13] g TRS/s-sq meter = 6.26E-02 g TRS/s ÷ 388550 sq meters = 1.61E-07 g TRS/s-sq meter

Table A-17
No. 4 Sludge Pond - Water9 Model Results
New-Indy Catawba - Catawba, SC

No. 4 SLUDGE POND													
		ACTUAL								MAXIMUM			
	MW	g/s	Reference	Justification	sq meters[5]	g/s-sq meter[6]	lb/hr[7]	ODTP/day[8]	lb/ODTP[9]	ADTP/day[10]	lb/hr[11]	g/s[12]	g/s-sq meter[13]
H_2S	34.08	2.65E-02	NCASI Form R and TB 956 and 1000[2]	NCASI Toxics Release Inventory (TRI) Form R Guidance and Free Sulfide Tool	44192	5.99E-07	2.10E-01	1553.08	3.25E-03	2700	3.29E-01	4.14E-02	9.37E-07
MM	48.11												
DMS	62.14												
DMDS	94.20												
TRS (as H_2S)	34.08	2.65E-02	Summation[4]	Summation of H_2S, MM, DMS and DMDS converted to common H_2S basis based on molecular weight of sulfur in each constituent	44192	5.99E-07	2.10E-01	1553.08	3.25E-03	2700	3.29E-01	4.14E-02	9.37E-07

[1] Reserved.

[2] NCASI Handbook of Chemical-Specific Information for Superfund Amendments and Reauthorization Act (SARA) Section 313 Form R Reporting - Pulp and Paper Facilities. Hydrogen Sulfide, Table 4 "WWTP PARTITIONING AND EMISSIONS OF HYDROGEN SULFIDE", Sludge Pond mean emissions factor of 4.2 lb/(day-Acre). H_2S emissions factor adjusted for pH using the NCASI Free Sulfide Tool (as described in NCASI Technical Bulletin 1000, section 3.2) and documentation of the emissions rate calculation is provided in the attached spreadsheet "EQ Basin and Sludge Lagoon Calcs.xlsx".

[3] There are no emissions of MM, DMS, and DMDS reported from the No. 4 Sludge Pond. Small amounts of MM, DMS, and DMDS that are contained in the water that remains with the sludge from the ASB are assumed to be emitted in the ditch #2 or ASB Zones 1-3.

[4] 2.65E-02 g TRS/s = [(2.65E-02 g H2S/s x 32.07 mol S/g ÷ 34.08 mol H2S/g) + (0.00E+00 g MM/s x 32.07 mol S/g ÷ 48.11 mol MM/g) + (0.00E+00 g DMS/s x 32.07 mol S/g ÷ 62.14 mol DMS/g) + (0.00E+00 g DMDS/s x 64.14 mol S/g ÷ 94.20 mol DMDS/g)] x (34.08 mol H2S/g÷ 32.07 mol S

[5] No. 4 Sludge Pond free water surface area was calculated using Geographic Information System (GIS) software.

[6] g TRS/s-sq meter = 2.65E-02 g TRS/s ÷ 44192 sq meters = 5.99E-07 g TRS/s-sq meter

[7] lb TRS/hr = 2.65E-02 g TRS/s x 3600 s/hr ÷ 453.592 g TRS/lb TRS = 2.10E-01 lb TRS/hr

[8] average pulp production during sampling on July 9, 10 and 11 (1694.16, 1609.17, 1355.92 ODTP/day)

[9] lb TRS/ODTP = 2.10E-01 lb TRS/hr x 1 hr/1553.08 ODTP = 3.25E-03 lb TRS/ODTP

[10] maximum production from June 2019 and April 2020 Project Columbia construction permit applications (construction permit DF)

[11] lb TRS/hr = 3.25E-03 lb TRS/ODTP x 2700 ADTP/day x 1 day/24 hr x 0.9 ODTP/1.0 ADTP = 3.29E-01 lb TRS/hr

[12] g TRS/s = 3.29E-01 lb TRS/hr x 453.592 g TRS/lb TRSx 1 hr/3600 s = 4.14E-02 g TRS/s

[13] g TRS/s-sq meter = 4.14E-02 g TRS/s ÷ 44192 sq meters = 9.37E-07 g TRS/s-sq meter

ATTACHMENT 3 – PRIMARY CLARIFIER H2SSIM MODEL

NCASI WASTEWATER HYDROGEN SULFIDE EMISSIONS SIMULATOR (H2SSIM)
Version 1.3

Data Type 1. Site Identification

Company Name	New-Indy
Facility Name	Catawba SC
Basin Name	Primary Clarifier

Data Type 2. Model Zone Information

Number of Zones	1
Zone Location of Hardpipe	None
Type of Basin	PC

Data Type 3. Load Characteristics

Loading Characteristics	Main Influent	Hardpipe	Units
Flow	21.35	0	MGD
Total Sulfide	0.02003706	0	mg/L
Sulfate	390	0	mg/L

Data Type 4. Atmospheric Conditions

Windspeed	3.79	mph
Ambient Temperature	79	F

Data Type 5. Zone Physical and Chemical Conditions

Zone Condition	Zone 1	Zone 2	Zone 3	Zone 4	Units
Dissolved Oxygen	0				mg/L
Temperature	111.9				F
pH	9.08				s.u.
Redox Condition	Anoxic	Aerobic	Aerobic	Aerobic	
Length	243.7				feet
Width	243.7				feet
Depth	5.41				meters
Mixing	Moderat	Moderat	Moderat		
Number of Aerators	0				
Total Horsepower	0				HP
Impellor Size	1.625				feet
Impellor RPM	1200				RPM
Diffused Air Flow	0				cms
Weir Height	0.38				meters

7/9/2021 - 7/11/2021 Average

Model Controls

Run H2SSIM

View Parameters

Clear Input Sheet

H2SSIM Results

7/9/2021 - 7/11/2021 Average

Basin Emissions		Units
Total Emissions (H_2S)	0.000	gms/s
Total Emissions (H_2S)	11.1	lbs/yr
Total Emissions (H_2S)	0.0	tons/yr
Total Emissions (H_2S)	0.0	tonnes/yr
Emission Flux (H_2S)	0.9	gms/m^2 yr

Zone Emissions	Zone 1	Zone 2	Zone 3	Zone 4	Units
Zone Emissions (H_2S)	0.00				gms/s
Zone Emissions (H_2S)	11.1				lbs/yr
Emission Flux (H_2S)	0.9				gms/m^2 yr
Liquid Conc. (Total Sulfide)	0.452				mg/L
Liquid Sulfide Load (lbs/yr)	4637.300				lbs/yr

Percent Inlet Sulfide Removed	-257.0%

Current Parameters	
kgen	0.25
ThetaGen	1.06
KDO	0.05
KSO4	10
kanox	0.006
ThetaOx	1.05
m	1
n	0.2
MLVSS	2500
O_2 Transfer Coeff.	2
alpha 1	0.83
alpha 2	0.6