

Badin Business Park LLC

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May 24, 2024

Bob Sledge
Environmental Specialist II
Division of Water Resources,
Water Quality Permitting Section – NPDES
1611 Mail Service Center
Raleigh, NC 27699-1611

Submitted via email: bob.sledge@deq.nc.gov

RE: Response to Request for Additional Information - Treatment Pilot Study
Badin Business Park, LLC

Dear Mr. Sledge:

Badin Business Park, LLC provides this update as requested by the May 8, 2024, North Carolina Department of Environmental Quality (DEQ), Water Quality Permitting Section email regarding the treatment pilot study for the reduction of fluoride concentrations at Badin Business Park Outfall 005. Each specific request for information is listed with a response to follow.

Request 1 – Include a description of the treatment system installed, including its location(s) within the conveyance.

Response 1: Since September 2023, the use of activated alumina has been tested to passively treat water discharged at Outfall 005. The use of activated alumina was introduced in a virtual meeting with DEQ in early 2023 and subsequent correspondences dated August 31, 2023, and September 12, 2023.

The assessment commenced on September 6, 2023, with the placement of 12 woven, monofilament filtration geotextile bags containing approximately 50-60 pounds of activated alumina each. The bags were placed directly in the storm sewer, in areas with storm water of known elevated fluoride concentrations and secured with ropes tethered to the surface. More specifically, 4 bags were placed in storm sewer utility access number 2.200, 3 bags in access number 2.210, and 5 bags in access number 2.310. Each of these locations are illustrated on **Figure 1**, attached. Flows in the sewer were observed to be very low or non-existent as a result of the dry conditions experienced in Badin during the months following installation. In attempt to improve system performance during the dry conditions all bags were relocated to access 2.310 on November 6th to create a dam like feature; thereby, increasing the potential surface area interface and media contact time.

The initial stage of the pilot program was simplistic in design and application and utilized to promptly employ a known and proven treatment process (i.e., use of activated alumina) while a more complex system was designed and constructed. In April 2024, an ex-situ treatment approach was installed where the fluoride-bearing water is pumped from the storm sewer to the surface and processed through a media adsorption bed. This method supports a more direct

assessment of performance as well as improved potential for fluoride reduction through increased contact.

The ex-situ system presently extracts stormwater from storm sewer utility access number 2.200 via a solar-powered, surface-mounted pump with an operating range between 3 and 18 gallons per minute (gpm). Water is being pumped directly from the storm sewer while awaiting the construction of two pumping sumps within the storm sewer near access 2.100. A delay in the sump construction was due to qualified contractor scheduling constraints. The extracted water is processed through a baffled four-chamber filter box, approximately 4 ft wide x 8 ft long x 3.5 ft deep. Each chamber is loaded with approximately 2 ft of activated alumina. The system effluent is discharged to sewer access number 2.100.

A few structural and operational modifications were completed following initial installation to avoid short circuiting of the baffles and treatment media. The ex-situ system began operating on April 30, 2024, at a flow rate of approximately 5 gpm.

DEO Comment 2 – A list of results to date from the analytical testing performed for the treatment pilot study.

Response 2: A summary of the analytical testing results performed for the treatment pilot study are presented to follow in **Table Response 2**. In general, no discernable trend has developed from the information gathered to assess the performance of the in-situ pilot treatment. Multiple changes in the sample locations identified in the Table were employed as a result of the dry conditions observed in the storm sewer during the monitoring period. Some of these locations are upstream of plugs installed in 2018 as part of the shallow storm sewer modifications which further complicated performance assessment.

Two sets of samples have been collected following the initiation of the ex-situ system with the first preliminary results received coinciding with the writing of this letter. Although it is premature to formulate conclusions, the preliminary data shows a reduction in the fluoride concentration across the treatment system with an Outfall 005 fluoride concentration of 1.4 mg/L (May 2nd grab sample). Samples will continue to be collected to assess the ex-situ system performance approximately every other week. Presently the system is only being monitored for fluoride and pH. Modifications to the monitoring plans may be employed.

Table Response 2 – In-Situ Monitoring Results

Date	Upstream			Downstream					
	Access	pH	Fluoride (mg/L)	Access	pH	Fluoride (mg/L)	Access	pH	Fluoride (mg/L)
9/13/2023	2.330		3.1	2.000		3.7			
9/22/2023	2.330		2.6	2.000		3.5			
9/27/2023	2.330		2.6	2.000		3.3			

Date	Upstream			Downstream					
	Access	pH	Fluoride (mg/L)	Access	pH	Fluoride (mg/L)	Access	pH	Fluoride (mg/L)
10/4/2023	2.330		2.9	2.200		3.4			
10/11/2023	2.330		3.0	2.200		3.4			
10/25/2023	2.330		4.7	2.200		3.1			
11/8/2023	2.330		2.7	2.200		2.6			
11/22/2023	2.330		2.8	2.100		2.8			
12/6/2023	2.330		1.8	2.000		2.5			
12/19/2023	2.330		2.3	2.100		2.6			
1/3/2024	2.330	7.14	2.4	2.100	7.24	2.6			
1/17/2024	2.330	6.81	2.3	2.100	7.1	2.5			
2/1/2024	2.330	6.65	2.2	2.100	6.98	2.8			
2/8/2024				2.100	7.04	2.5	2.05	6.87	1.9
2/14/2024	2.330	6.57	2.3	2.100	6.86	3.4			
2/28/2024	2.330	7.34	2.6	2.100	7.59	2.6	2.05	7.09	2.1
3/13/2024	2.330	6.93	2.7	2.100	7.21	2.9	2.05	7.08	2.4
3/26/2024	2.330	6.96	2.8	2.100	7.17	2.6	2.05	7.08	2.2
4/2/2024	2.330	6.87	2.5	2.100	7.24	<1	2.05	7.06	2.2
4/17/2024	2.330	6.92	2.3	2.000	7.05	2.9	2.05	6.92	2.0
5/2/2024	2.330	7.50	2.5	2.000	7.44	<1.0	2.05	6.85	1.6

DEO Comment 3 – A preliminary evaluation of the effectiveness of the treatment system and its prospects for achieving consistent compliance with permit limits for fluoride at Outfall 005.

Response 3: The in-situ treatment has been in place since September 2023 with modifications conducted in November. No discernable trend has developed from the information gathered to assess the performance of the in-situ pilot treatment. However, since November 2023, the NPDES Outfall 005 has met the monthly average permit limit of 1.8 mg/L.

Insufficient information has been obtained to date to formulate an educated opinion on the effectiveness of the ex-situ treatment system followings its initiation on April 30, 2024.

DEO Comment 4 – A statement regarding current plans and next steps proposed to ensure compliance with permit limits at Outfall 005, including a timeline for their implementation.

Response 4: The site has been compliant with NPDES Outfall 005 permit limits since November 2023. Operation of the pilot treatment system is planned to continue throughout 2024. At present the in-situ treatment system remains in place but may be removed upon further assessment of the ex-situ treatment effectiveness. Operation of the ex-situ system will continue to be monitored to assess both short and long-term viability. Installation of the collection sumps are scheduled for June and a redundant system is being considered taking into account design modifications

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identified from the initiation of the existing system. Ultimately, the pilot treatment assessment on the Outfall 005 storm sewers will be used to inform a final remedy proposal.

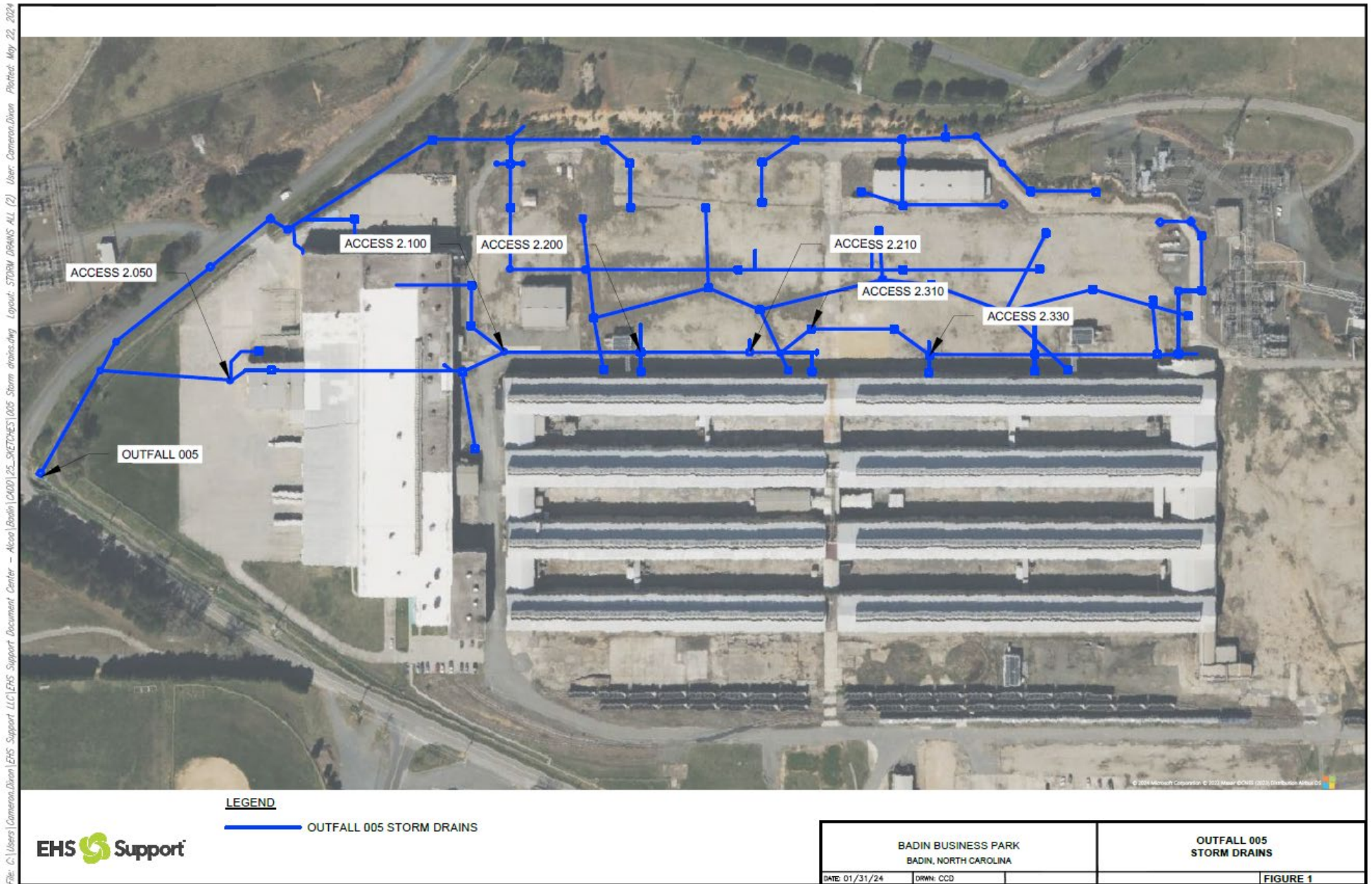
If you have any questions or need additional information, please do not hesitate to contact me at Robyn.Gross@alcoa.com or 412.315.2780.

Sincerely,

A handwritten signature in blue ink, appearing to read "Robyn L. Gross".

Robyn L. Gross
Global Director, Alcoa Transformation
Badin Business Park LLC

cc: Julie Grzyb, NCDEQ
John Hennessy, NCDEQ
Andrew Moore, NCDEQ
Brandy Costner, NCDEQ
Roberto Scheller, NCDEQ
Wes Bell, NCDEQ
Jason Mibroda, Alcoa Corporation



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