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## MEMORANDUM

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DATE November 2, 2022

TO Andy Peters  
City of Molalla

FROM Tyler J. Molatore, PE

PROJECT NAME Aeration Basin Asphalt Liner Failure  
City of Molalla

PROJECT NO. 198.28

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During the week of October 3<sup>rd</sup>, the City of Molalla (City) lowered the Aeration Basin to inspect and repair a suspected hole developing in the asphalt liner. After lowering the liquid level in the Aeration Basin, the City determined that the asphalt liner would require a comprehensive repair plan.

Based on the extent of the problems with the asphalt liner, the City concluded that continued operation represented a risk of possible negative environmental impacts. After consultation with the Oregon Department of Environmental Quality (DEQ), to avoid the possible impacts to groundwater, or Bear Creek, and the City's experience with the limited aeration occurring in the Aeration Basin, the City decided to immediately remove the Aeration Basin from service. The City subsequently drained the Aeration Basin and raw wastewater is now bypassing the Aeration Basin and being conveyed directly from the influent screening system to the Transfer Pump Station, where it is then pumped to the first treatment lagoon, Lagoon No. 1. The City documented the results of their inspection and subsequent bypassing of the Aeration Basin in the attached letter from the City to the Oregon DEQ.

### Background

The Aeration Basin consists of a 1.3 MG asphalt lined basin that was originally designed with six 10-hp aerators to provide oxygen transfer. The Aeration Basin is located in between the influent screening facility and the Transfer Pump Station. There is limited performance data documenting the influent and effluent quality, or dissolved oxygen concentrations, of the Aeration Basin. However, the aerators do impart dissolved oxygen into the wastewater and the basin does provide detention time for kinetic reactions and BOD<sub>5</sub> removal to occur.

**FIGURE 1  
AERATION BASIN LINER FAILURE**



### **Aeration Basin Repair or Replacement**

The condition of the Aeration Basin was evaluated for repair or replacement requirements, including lining with a geomembrane liner, spot repairs, or complete replacement with a concrete structure. Due to high groundwater conditions, lining of the Aeration Basin, or future Equalization Basin, is not a viable option. The Aeration Basin and future Equalization Basin are operated at variable liquid levels. Groundwater levels at finished grade are anticipated during the winter months, which could present issues with floating the liner.

Installing a cast-in-place concrete structure equivalent in size to the current Aeration Basin is an option, but is cost prohibitive and requires time for design and construction. Commissioning of the structure would not occur until the summer or fall of 2023. Constructing the Equalization Basin (to be used in the proposed upgrades) is another option, but would provide only 315,000 gallons of volume, and also would not be commissioned until the summer or fall of 2023.

Spot repairs of the Aeration Basin, with asphalt or shotcrete, is an option that could repair damaged areas in the basin. The effectiveness of the spot repairs is unpredictable and achieving allowable leakage standards set forth by Oregon DEQ is uncertain. More research regarding spot repair methods is warranted. Further discussions with DEQ regarding the performance requirements of spot repairs is also recommended. We would recommend a leak test following the spot repairs, if completed.

### **Elimination of the Aeration Basin**

Eliminating the Aeration Basin from the facility was investigated with respect to its impacts on compliance with the City's discharge permit and Mutual Agreement and Order. Bypassing of the Aeration Basin reduces aeration and detention time from the wastewater facility. Wastewater treatment is primarily a function of air and time.

The BOD<sub>5</sub> removal from the Aeration Basin was estimated using general design criteria for mechanical surface aerators. As reported in Wastewater Engineering (Metcalf and Eddy, 2014), the transfer rate (field conditions) for various types of mechanical aerators ranges between 0.8 to 2.4 lb O<sub>2</sub>/hp-hr. With six aerators in operation, at 10 hp each, the oxygen transfer rate ranges between 1,152 to 3,456 lb O<sub>2</sub>/day. Assuming 1 lb BOD<sub>5</sub> removal per 1.5 lb O<sub>2</sub>, the BOD<sub>5</sub> removal is estimated between 768 to 2,304 lb BOD<sub>5</sub>/day. For context, the influent BOD<sub>5</sub> and TSS, as reported in the City's September 2022 Discharge Monitoring Report was 1,123 and 945 lb/day, respectively.

This estimated BOD<sub>5</sub> removal rate is based on textbook values. No field data has been obtained to verify the actual performance of the aerators and Aeration Basin. The ability to effectively transfer oxygen throughout the Aeration Basin is limited due to the depth, as well as the configuration of the aerators. It is the City's understanding that the Aeration Basin provides minimal BOD<sub>5</sub> removal.

The detention time of the Aeration basin was evaluated to understand if the volume is satisfactory to provide adequate time for BOD<sub>5</sub> removal to occur. The Aeration Basin is 1.3 MG. The average monthly flow in September 2022 was 0.659 MGD. Based on the Wastewater Facility and Collection System Master Plan (The Dyer Partnership, 2018), the average wet weather flow was reported as 2.48 MGD. The hydraulic detention time, based on September 2022 flows, is approximately 2 days. The hydraulic detention time based on historical average wet weather flows, is approximately 12 hours. With proper mixing and aeration, this detention time is sufficient to provide appreciable BOD<sub>5</sub> removal.

Removing the Aeration Basin from the process will likely have an impact on the overall BOD<sub>5</sub> removal capabilities of the Wastewater Treatment Plant. Compared to previous conditions, higher organic loads will be conveyed to the lagoons. Previous studies and evaluations have concluded that the existing lagoons are operating in a stressed condition with regard to processing influent flows and loads. Based on textbook loading criteria, the capacity of the existing lagoons is between 0.65 to 1 MGD.

To compensate the lost aeration, a new aeration system, in addition to the two aerators currently located in Lagoon No. 1, could be added to Lagoon No. 1. The aeration system would meet or exceed the estimated oxygen previously transferred to the Aeration Basin (with the existing mechanical aerators). The time to implement the aeration system is not immediate. The aeration system will require time for design, electrical upgrades, and procurement of equipment with long lead times.

Due to the volume of solids currently residing in Lagoon No. 1, once in operation, the proposed aeration system will resuspend solids and likely require an acclimation period in which strict discharge permit compliance may be difficult.

### **Recommendations**

The existing Aeration Basin was providing BOD<sub>5</sub> removal, but without process data from the Aeration Basin the actual removal rate is unknown. Without a definitive understanding of the performance of the Aeration Basin, but understanding that its elimination represents a possible decrease in the BOD<sub>5</sub> removal capabilities of the overall wastewater facility, the City should be prepared to counteract the aeration lost due to removal of the aerators. Following is a brief list of recommendations:

1. The City should closely monitor the performance of the lagoons given the possible higher organic loading due to the elimination of the Aeration Basin from the treatment process. Monitoring the effluent (BOD<sub>5</sub>, TSS, Ammonia, pH) from the lagoons, and comparing to historical trends, is recommended.
2. Evaluate the immediate installation of aeration into Lagoon No. 1, to offset the aeration lost by removing the Aeration Basin. The Dyer Partnership can assist the City with design of the aeration system for Lagoon No. 1.
3. Reinstall the jockey pump at the transfer pump station to maintain the design capacity of the pump station and the ability to transfer peak influent flows to Lagoon No. 1. The jockey pump was damaged during an electrical power event in 2021, but has not been replaced due to equipment lead time and product availability issues. The Dyer Partnership can assist the City with pump selection and procurement needs.
4. Evaluate the scope and effectiveness of spot repairs to the Aeration Basin. Achieving watertightness with spot repairs is uncertain, but given the possible BOD<sub>5</sub> removal capabilities of the Aeration Basin and time required to install an aeration system in Lagoon No. 1, spot repairs should be further investigated to better define the scope and costs. The Dyer Partnership can assist the City with evaluation of spot repairs.

END OF MEMORANDUM



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October 13, 2022

To: Mike Pinney  
Oregon Dept of Environmental Quality

**RE: Aeration Basin Drawdown and Inspection**

Dear Mike,

The City of Molalla has drawn down and bypassed its influent Aeration Basin due to the development of holes in the Asphalt Lining. This report documents the situation and findings as we understand them today. On October 5<sup>th</sup> 2022 the Lead Operator contacted me regarding what appeared to be a hole developing in the asphalt lining of the influent aeration basin at the Molalla WWTP. The observed hole is as it appeared that day are shown in the image (right). I asked him to organize a drawdown of the aeration basin so that





we could inspect. The initial drawdown occurred on October 10<sup>th</sup> (the same day as an unrelated Recycled Water Spill, which has been previously reported). That initial inspection revealed that the asphalt lining had failed in multiple locations. The wide-angle photograph below was taken during that inspection. The City began treating the situation as a full failure of the aeration basin and, to be as conservative as possible, ran its emergency procedures.

The first concern was whether any raw sewerage from the Aeration Basin was immediately leaking in to Bear Creek to the North. However, an inspection of the creek bed revealed it was dry to the east in the direction of the Aeration Basin, no leaking was immediately evident. The image below is taken from the Driveway bridge at the wastewater plant, facing East up the creek, along side the aeration basin. The

nearest standing water in the creekbed was observed to the West of this bridge, but this pool (1) did not appear to be flowing, and (2) had obvious signs of aquatic creatures (tadpoles and small fish) indicating to us during our inspection that the pool had good dissolved oxygen, not the low oxygen one would expect of raw sewage from the Aeration Basin.

Next, DEQ was contacted by telephone (24hr notice). I reviewed the situation with Tiffany Yelton-Brahm around 5pm on the 10<sup>th</sup>. We decided during that call that the most important thing to do right then was to completely bypass the aeration basin and perform a more thorough inspection. That more thorough inspection happened on October 11<sup>th</sup> and consisted of:





- a. Walkaround: the entire structure was found to be in poor condition with multiple holes in the asphalt lining below the normal high-water level.
- b. Shovel Checks: I descended the side of the structure suspended by a rope and worked the area that appeared to be still asphalt with a shovel. The asphalt came apart with ease.
- c. Hand Checks: I pulled gently on portions of the asphalt lining that appeared to be in good shape and they flaked away under my fingers.

Two photographs below follow. The first is from the inspection on October 11<sup>th</sup>, 2022. The second is the same angle, photo from archives, on the dewatered aeration basin taken during biosolids removal in 2018.







Upon these findings the Transfer Pump Station was configured to permanently bypass the aeration basin. The Basin may experience water entering as the winter months approach, but the intent is to keep it clear of raw influent until further notice. The City expects that the transfer pumps can keep up with the expected peak winter flows, and the City does not believe equalization of raw sewerage in the basin should be required (peak influent flows observed are in the 9.0 MGD range, whilst the two large transfer pumps (Grundfos Model S3.45.A.1.20.1070.8) are plated to run Qmax of 9,827 gpm each which should be more than sufficient. A small amount of water is required to be left in the basin so that these Transfer Pumps do not cycle so much that they will burn up.

On the morning of October 12<sup>th</sup>, 2022 I had a meeting with the City Engineer (Dyer Partnership, who is also performing the design of the new Wastewater Facility). They had reviewed all the above mentioned findings and were asked to begin the process of providing assessment, options, and recommendations in the form of a technical memorandum. They are also reviewing the best way to configure the pumps, and determining what kind of additional aeration, if any, may need to be added to Lagoon 1 to compensate for the loss of treatment in the aeration basin. Dyer expects to produce that memorandum by October 26<sup>th</sup>.

Respectfully,

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