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To:

Ms. Amy Manzelli, Esq.  
BCM Environmental & Land Law, PLLC  
3 Maple Street  
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25 October 2024

Subject: Overliner penetration: NCES Landfill

Dear Ms. Manzelli:

As per the agreement of service with BCM Environmental & Land Law, PLLC (BCM), I have reviewed the 14 June 2024 Letter of Deficiency issued by the New Hampshire Department of Environmental Services (NHDES) with respect to the North Country Environmental Services (NCES) Landfill, located in Bethlehem, New Hampshire and the 6 September 2024 Incident Report for the same landfill. I also reviewed the Design Plans (2003) and Revised Construction Plans (2005) for the Stage IV development of the subject landfill.

In this letter, I present my comments related to the reported penetration of the overliner in the Stage IV, Phase I area, which is believed to be the cause of the high leachate levels measured at various locations of the landfill.

### **Background**

I previously reviewed the Letter of Deficiency issued by the NHDES on 14 June 2024, in which numerous instances of leachate storage over the liner in excess of 12 inches of head were reported. These instances were in connection with Stage IV, Phases I and II, as well as Stage III. In my letter dated 9 September, I discussed the adverse impacts of high leachate levels and emphasized the need for investigating the underlying cause why the actual leachate generation rate was significantly higher than the value that was anticipated during design.

According to the Incident Report from 6 September, the increased leachate flow in the landfill liner secondary system is attributed to the penetration of the overliner during the drilling of landfill gas wells. According to the Incident Report, 11 landfill gas wells were

installed between 9 September 2014 and 27 June 2024, which penetrated both liners of the overliner system to extract landfill gas from the waste mass beneath the overliner.

Further, according to the Incident Report, one landfill gas extraction well (GW-202) “*has been pulling leachate from the waste mass underlying the overliner and discharging a significant portion of the leachate into the secondary collection system of the overliner.*”

The operators of NCES Landfill have stated on the Incident Report that “[n]o release to the environment was caused by these incidents. As mentioned above, there is a double-liner system beneath the overliner that is intact and functioning as designed. All secondary detection liquids are captured and managed in the leachate collection system and transported off site for treatment.”

Additionally, according to the operators “*Casella's investigation has concluded that while liquid levels on the base liner secondary are exceeding an action level, the magnitude of the increase is within the hydraulic capacity of the systems. Additionally, the Stage I primary and secondary leachate systems are functioning properly, and leachate is being managed in a manner that has prevented a release to the environment. Leachate passing through the penetrations in the overliner have no pathway to the environment and are instead captured by the Stage I liner.*”

In terms of corrective measures taken, the operators have reported that “[t]o reduce the secondary leachate flows in the areas of the gas wells discussed, NCES proposes to seal off wells 202, 146 and 148 via the use of a cement and bentonite grout mix to an elevation above the area of penetration. Sealing and grouting will put a thin grout down the center tube running down the entire column of each well. The grout mixture will push out of the perforated piping and into the stone pack around the edge of the overliner, sealing off the penetration area.”

### **Comments and Questions**

1. The location of the gas wells which penetrated the overliner are not provided in the Incident Report. Also, the total depth of each gas well, in addition to the depth below the overliner, extending into the Stage I area are not provided. It is imperative that these details be provided in order to obtain a full appraisal of the extent of the damage and to understand the effectiveness of any remedial measure.

2. According to the Incident Report, four of the wells, GW-146, 172, 202, and 206 remain active in the area of the overliner. The remedial measure of sealing off the wells is proposed for three of these wells, GW-146, 148, and 202. It is not clear why the same remedy is not extended to GW-206 and whether a different remedy is proposed for that well.
3. The proposed remedy of pouring a thin grout mixture through the pipe, with the goal of pushing it out of the perforations and into the stone pack, may not be sufficient to seal the contact between the overliner and the pipe. Normally, when a penetration is intentionally included as part of the design, a sealed boot would be constructed attached to a collar, which itself is welded to the outer surface of the pipe. This construction would be followed by a thorough inspection and testing of the boot and collar to ensure no escape route would exist to allow liquid to flow. It is important to emphasize that, even if it were to function as intended, the proposed remedy would not be nearly as protective against leachate flow around the pipe as a pre-designed penetration. There is no information provided regarding the spacing (both around the circumference and vertically along the pipe) between the perforations on the gas well. Therefore, it is not clear that a set of perforations will line up with the overliner interface and that there will be sufficient grout coverage around the entire circumference of the well at its contact with the overliner.
4. The remaining seven gas wells were reportedly decommissioned between 2017 and 2024. No information is provided as to the process followed while decommissioning those wells. For example, it is not clear that the contacts between those wells and the overliner were sealed. If they were not sealed, then those wells and the overliner penetrations around them will continue to serve as conduits for leachate flow into the underlying Stage I area.
5. If gas well GW-202 was extracting leachate (as stated in the Incident Report), then it is not clear how the gas extraction system of the same well was functioning. The capacity of the gas extraction system for the landfill would have been compromised because some of the gas wells were, in fact, extracting liquids. It is not clear if there should be concerns about a build-up of landfill gas inside the cells which these extraction wells were intended to serve, because the gas wells were not performing at their intended design capacities.

6. Assuming new gas extraction wells will be installed in the future, what preventive measures will be taken to ensure the new gas wells do not further damage the overliner?
7. Is there any evidence to support the operators' claim that the *“double-liner system beneath the overliner ... is intact and functioning as designed. All secondary detection liquids are captured and managed in the leachate collection system and transported off site for treatment”*?
8. The operators have claimed that *“the magnitude of the increase [of leachate flow into the Stage I base liner secondary] is within the hydraulic capacity of the systems. Additionally, the Stage I primary and secondary leachate systems are functioning properly, and leachate is being managed in a manner that has prevented a release to the environment. Leachate passing through the penetrations in the overliner have no pathway to the environment and are instead captured by the Stage I liner.”* Based on the Letter of Deficiency issued by the NHDES dated 14 June 2024, the leachate head over the landfill liner was higher than the maximum permissible level of 12 inches at numerous locations of the landfill on various dates. These exceedances indicate that the hydraulic capacity of the system was not functioning as intended, contrary to the claim made by the operator. The system was overwhelmed by the amount of leachate, because the leachate head was allowed to increase to as much as nearly ten times the permissible level. The calculations of the hydraulic capacities of the primary and the secondary systems prepared during the original design must be submitted for review, as evidence in support of this claim. What is the estimated amount of leachate flow through the overliner-gas well contacts, which is contributing to the collection of leachate in the secondary leachate system? How does that compare with the maximum hydraulic capacity for which the system was designed?
9. An inventory of the groundwater monitoring wells around the affected areas (Stage IV, Phases I and II, as well as Stage III) needs to be obtained. These wells must be monitored closely in order to detect any change that could be attributed to the flow through the breach of the overliner system, potentially reaching the groundwater. Similarly, the water quality in the nearby surface water bodies (e.g., the Ammonoosuc River) must be monitored to detect the potential release of contaminants from the landfill.

## Summary

I have previously (letter dated 9 September 2024) discussed the adverse impact of high leachate level over the liner. I will reiterate that high leachate levels have been attributed to many landfill failures with serious consequences, including fatalities. It is extremely important that the cause of the high leachate level be completely understood and steps taken to eliminate them.

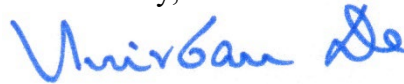
The report from the operators of NCES Landfill appears to indicate that a cause has been identified. It is important to investigate and ascertain if *all* possible sources of leachate incursion have been identified and no source remains unnoticed. In this letter, I have raised questions about the way the decommissioned gas wells were sealed and whether those can act as conduits. Also, I have raised questions about the proposed method of sealing the wells.

I question the operators' claim that the double-liner is intact and functioning properly and that the leachate is being managed in a manner that has prevented a release to the environment. Evidence needs to be provided to support these claims.

The fact that gas wells were allowed to contribute to the leachate flow into the secondary leachate system and this very serious breach remained unnoticed for 10 years should raise questions about this operator's ability to operate and maintain landfills in a safe and proper manner without posing a major risk to the environment. The operator must demonstrate why the affected areas of the NCES Landfill are considered fit to continue to receive waste without risking a major release of leachate into the ground.

Please let me know if you have questions about my comments and/or require further discussions.

Sincerely,



Anirban De, Ph.D., P.E.