

REDUCING PFAS IN LEACHATE FROM STATE-OWNED LANDFILLS
Stakeholder/Interested Parties Information Meeting
October 6, 2022

REDUCING PFAS IN LEACHATE FROM STATE-OWNED LANDFILLS

Agenda

- Scope of Study
- Nature and Fate of PFAS
- Overview of the Dolby and Juniper Ridge Landfills (JRL)
- Characterization of Leachates
- Initial Findings (re. Technologies for PFAS Reduction)
- PFAS Treatment Options for Dolby and JRL Leachate
- Study Tasks to be Completed
- Final Report and Schedule

HOW TO APPROACH TREATMENT

1. What are we treating for and to what level?
2. What is the level of pollution in the leachate?
 - Potential Impacts of Co-contaminants
3. What is the volume of the leachate?
4. What are the characteristics of the contaminants?
5. What technologies can be implemented to reduce the levels of the contaminants?

SCOPE OF STUDY

- Identify and evaluate commercially available treatment technologies capable of reducing PFAS in leachate from Dolby and JRL to below the State of Maine MCL for PFAS in drinking water
- Maine DW Maximum Contaminant Level (MCL) for PFAS:
 - The Sum of Six = PFOA + PFOS + PFHpA + PFHxS + PFNA + PFDA
 - The Sum of Six: Less than 20 nanograms per liter (ng/l)
- Develop conceptual leachate treatment train process and capital and O&M costs to reduce PFAS at Dolby and JRL

NATURE & FATE OF PFAS

- PFAS is short for per- and polyfluoroalkyl substances
- PFAS are used to manufacturer such products as Teflon, GoreTex, stain repellants, AFFF (effective at extinguishing petroleum-based fires), paper packaging, cosmetics, and numerous other consumer products
- PFAS are often referenced as “Forever Chemicals” due to the Carbon-Fluoride bond that is not susceptible to degradation in the environment or by conventional WTPs and WWTPs

COMPLEXITIES/CHALLENGES MANAGING PFAS

- Ubiquitous presence of PFAS throughout the environment
- Defining the health impacts: health agencies working to understand long-term, low-level exposure risks
- Analytical DL: we are dealing with “nanogram per liter (ng/l)” levels
- Regulatory: Maine is 1 of 7 states with Maximum Contaminant Levels
- Need to develop commercially available technologies to reduce PFAS
- Technical practicality and cost to remediate
- Complex nature of landfill leachate (not a “clean” groundwater)
- Local versus regional approach
- **LD 1875 FOCUS IS LIMITED TO PFAS IN LEACHATE FROM DOLBY/JRL**

OVERVIEW OF DOLBY AND JRL

DOLBY LANDFILL

- Landfill is CLOSED, covers 151 acres
- Received mostly paper making residuals from 1975 - 2012
- LF is unlined (receives groundwater)
- Roughly 75% of LF covered with soil and 25% with final geomembrane
- Average leachate flow = 127,000 gpd
- Leachate is treated at EMWWTP then discharged to Penobscot
- Dolby leachate blends with EM sanitary flows (343,000 gpd)
- Other than storage, no pretreatment

JUNIPER RIDGE LANDFILL

- Landfill is open; today covers 112 acres; final build-out 120 acres
- Began receiving waste in 1980s (MSW, CDD, sludge)
- LF is double-lined (no groundwater)
- 54.6 acres with intermediate cover
- Average leachate flow = 42,000 gpd
- Leachate is hauled by tanker to Nine Dragons WWTP then discharged to Penobscot
- JRL leachate blends with ND industrial flows (>20 mgd)
- Other than storage, no pretreatment

DOLBY LANDFILL



DWG: SITEOVERVIEW LMK: PRELIM SITEPLAN CTR: SME-STD REV: 9/19/2022



LEACHATE PIPED 3.7 MILES TO TREATMENT PLANT EMWWTP
LEACHATE POND AND PUMP STATION

DOLBY LANDFILL
LEACHATE TO EMWWTP

SME
SEVEE & MAHER
ENGINEERS

JUNIPER RIDGE LANDFILL



600 0 1200 FEET
LANDFILL PLAN



LEACHATE TRUCKED 7 MILES TO TREATMENT PLANT
LEACHATE LOADING RACK AND TANK

JUNIPER RIDGE LANDFILL
LEACHATE TO NDWWTP

SME 
SEVEE & MAHER
ENGINEERS

PFAS IN LANDFILL LEACHATE

State of Maine LF Sampling (1st Rd)

- 38 LFs sampled (including Dolby/JRL)
- Average Sum of Six: 1,625 ng/l
- Median Sum of Six: 505 ng/l

Dolby LF Sampling (1st Rd)

- Dolby 1st Rd Sum of Six: 351 ng/l
- [Roughly in the bottom 40th Percentile]

Juniper Ridge Sampling (1st Rd)

- JRL 1st Rd Sum of Six: 410 ng/l
- [Roughly in the bottom 50th Percentile]

JRL RAW, DOLBY RAW, POND EFFLUENT, EMWWTP INFLUENT AND EFFLUENT

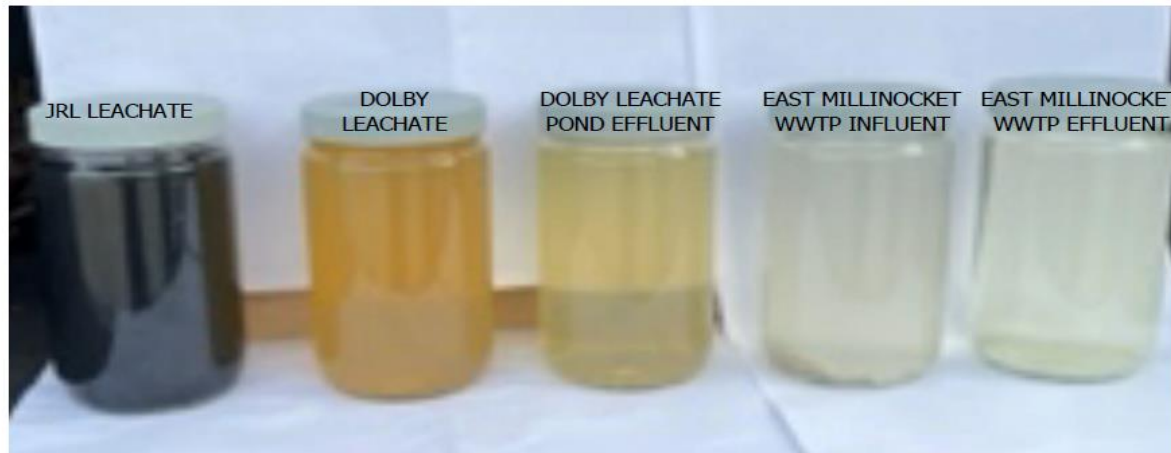


FIGURE 2
PHOTOGRAPH OF DOLBY
AND JRL LEACHATES

LEACHATE CHARACTERIZATION

DOLBY LANDFILL

Characteristics: dilute, clean, no odors, aerobic, neutral pH, low conductivity

- Organic Content: very low
- Ammonia as Nitrogen: 9 mg/l
- Toxic Organics: None
- Anions: sulfate/chlorides: low
- Iron and Manganese: low
- Pretreatment: not a challenge

JUNIPER RIDGE LANDFILL

Characteristics: concentrated, opaque, H₂S/NH₃ odors, anaerobic, neutral pH, very high conductivity

- Organic Content: high
- Ammonia as Nitrogen: 680 mg/l
- Toxic Organics: 740 ug/l VOC
- Anions: sulfate/chlorides: high
- Iron and Manganese: (modest)
- Pretreatment: challenging

PFAS TREATMENT DATA SOURCES

- PFAS Technical and Regulatory Guidance Document, Interstate Technology and Regulatory Council (ITRC), 2022
- Drinking Water Treatment for PFAS Selection Guide, American Water Works Association, 2021
- Review of Water Treatment Systems for PFAS Removal, Concawe Environmental Science for European Refining, 2020
- PFAS Innovative Treatment Team (PITT), USEPA, 2020-2022
- Multi Industry PFAS Study, USEPA, 2021
- Treatment of Contaminants of Emerging Concern in Landfill Leachate, Vermont Department of Environmental Conservation, 2020
- PFAS at Wastewater Treatment Facilities and Landfill Leachate, Weston & Sampson (prepared for VTDEC), 2019
- Initiatives to Evaluate the Presence of PFAS in Municipal Wastewater and Associated Residuals (Sludge/Biosolids) in Michigan, Michigan Department of Environment, Great Lakes and Energy (EGLE), 2020

TECHNOLOGIES FOR TREATING PFAS

DRINKING WATER TREATMENT

- Ancillary Support Technologies
- Demonstrated PFAS Removal: Ion Exchange (IEX), Granular Activated Carbon (GAC), reverse osmosis (RO)
- Developing PFAS Removal: alternate sorbents; Electrochemical Oxidation (EO)
- Processes for regenerating GAC/IEX (thermal, super critical water oxidation (SCWO), EO)

LEACHATE TREATMENT

- Ancillary Support Technologies
- Demonstrated PFAS Removal: Foam Fractionation (FF), limited IEX polishing
- Developing PFAS Removal: SCWO, Electrochemical Oxidation
- Regionalization Approach
- Residuals Treatment: volume reduction, stabilization, EO, plasma, SCWO, thermal

TREATMENT OPTIONS

DOLBY LANDFILL

- Truck leachate to regional treatment facility (Anson-Madison or similar)
- Continue treatment at EMWWTP with PFAS reduction via GAC and/or IEX at EMWWTP Effluent
- “Upfront Bulk PFAS Reduction” at Dolby, continue secondary treatment at EMWWTP
 - FF, EO or SCWO as “bulk PFAS reduction”
 - EO or SCWO for concentrate treatment
 - Consolidation of residuals for LF disposal or stabilization

JUNIPER RIDGE LANDFILL

- Truck leachate to regional treatment facility (Anson-Madison or similar)
- “Upfront Bulk PFAS Reduction” at JRL, continue secondary treatment at Nine Dragons
 - FF, EO or SCWO as “bulk PFAS reduction”
 - EO or SCWO for concentrate treatment
 - Consolidation of residuals for LF disposal or stabilization
- Extensive pretreatment at JRL with PFAS removal via regenerable IEX
 - EO or SCWO for destroying concentrate
 - Consolidation of residuals and LF disposal or stabilization

STUDY STATUS

TASKS COMPLETED

- Site inspection and LF Design Review
- Inspected EMWWTP and Design Plan
- Leachate sampling and analysis (4 rd)
- Initial leachate characterization
- Completed Regulatory Analysis
- Completed leachate flow projections with various cover scenarios
- Initiated discussions with potential PFAS treatment vendors
- Coordinated two bench scale FF lab studies with leachate from Dolby/JRL

ON-GOING TASKS

- Continue discussions with vendors
- Develop conceptual options for PFAS reduction specific to Dolby/JRL
- Evaluate effectiveness, reliability and costs for developed options
- Summarize recommended plan for both Dolby and JRL
- Prepare Draft Report with Executive Summary
- Prepare Final Report Addressing BGS and MEDEP Review Comments

FINAL REPORT AND SCHEDULE

- Draft Report BGS: Dec 2022
- Final Report to BGS: Early Jan 2023
- Final Report to Legislature: Jan 15, 2023

TAKE AWAYS TO CONSIDER

- No two landfills are alike, leachate treatment needs to be tailored to the individual site (no cookie cutter approach)
- Landfill leachates are a complex matrix and treatment will be challenging and likely expensive to remove PFAS
- PFAS reduction to be in the very low ng/l range
- There are no established regulations for PFAS in leachate (cleanup level may become a moving target); if leachate regulations are established it will likely be years away
- In addition to the desire to remove PFAS, leachate must also be treated for conventional pollutants such as BOD5, TSS, ammonia, pH and toxics

DISCUSSION/COMMENTS/QUESTIONS

MEDEP PFAS Webpage is quite
extensive for PFAS questions

[http://www.maine.gov>topics>PFAS](http://www.maine.gov/topics/PFAS)

Further Questions?

Email:

William Longfellow – Director Bureau of General Services

William.Longfellow@maine.gov

Wallace Giakas – Landfill Manager

Wallace.Giakas@maine.gov