251 E Front St., Suite 400, Boise, ID 83702
P 800.590.5220 F 208.331.7900

DATE: December 22, 2022 (Revised)

TO: Bruce Thompson, ***de maximis, inc.***

FROM: Joseph J. Weismann, CHP
Director, Radiological Programs

RE: AFTER ACTION SPILL REPORT – Grafton & Upton Railroad for Nuclear Metals Project

cc: John DeWaele, General Manger – Grafton & Upton Railroad
Wayne Hinton, Rail Program Manager – US Ecology., Inc.

On the morning of November 17, during initial transload activities of wastes from the former Nuclear Metals site (NMI) at the Grafton & Upton Railyard (G&U) in Hopedale, MA, representatives at the G&U observed the truck liners failing as they were being dumped into the awaiting gondola railcars. The liners in use are flexible bulk packages made of woven synthetic fabrics designed to fit inside the bed of a dump truck (or dump trailer).

The events on November 17 triggered a series of corrective actions and continued observation of the truck to gondola railcar transloads by the NMI Team at the G&U Railyard. This report documents these observations, the results of incrementally implemented corrective actions, our best assessment of the root cause of the liner failures, and any longer-term corrective actions designed to reduce (and hopefully eliminate) liner failures in the future. US Ecology has performed truck to rail transloads of this type for many years, including at the G&U facility, and has not observed consistent truck liner failures of this type in the past. It is the objective of this investigation and corrective actions to improve the performance of the transload operations.

It is worth noting that the use of truck and railcar liners on the NMI project is primarily for housekeeping purposes and to prevent fugitive dust emissions during transportation. There are no regulatory requirements that are driving use of truck or railcar liners for the wastes being generated on the NMI project. The wastes being transported from NMI are

non-hazardous (per US EPA's Resource Conservation and Recovery Act [RCRA] regulations) and are below US Department of Transportation (DOT) regulatory requirements for marking, labelling, or manifesting that hazardous materials would require. Furthermore, there are no Reportable Quantities (as provided in Appendix A of 49 CFR 172.101) for potential spills of these materials during transportation.

Description of Events

Waste loading began at the NMI site the morning of Thursday, November 17, 2022. Three trucks were in rotation between the NMI site and the G&U railyard. Each truck had a liner installed prior to loading waste soils. Each truck was scheduled to make (3) load and dump "turns" during a workday, resulting in (9) completed waste loads per days being transloaded into railcars at the G&U.

Of the first (6) trucks that were loaded the morning of 11/17/22, (4) liners were observed to split during transload. In all cases, liner failures occurred within the gondola railcar with a very small amount of waste soil exiting the car onto the surrounding rail track and ballast surface. Site workers captured photos and videos of the transload activities and forwarded them to the Project team for observation and analysis.

G&U staff covered the waste soil with plastic to prevent spread. US Ecology deployed an emergency response crew from our Franklin, MA office during the afternoon of 11/17/22 to recover the spilled NMI soil (and some retained water from rainwater puddles) and place them back into an adjacent railcar. A skidsteer as well as a crew of workers with shovels were used to remove all observed spoils from the track and ballast areas of the G&U yard and restore the yard to as-found conditions. A copy of the US Ecology Incident report is provided in Attachment A. Liner failures also occurred on 11/18/22, which resulted in two further small soil spills outside the gondola car. US Ecology's emergency response crew cleaned these spills up using the same approach used on 11/17/22.

Operations continued the next week after the initial cleanup. The NMI project team (de maximis and US Ecology)implemented a few initial corrective actions (see below) on Monday 11/21/22 and continued observing transload activities. Liner failures continued to be observed. Small external spill events occurred on 11/21/22 that the G&U RR facility operations team cleaned up themselves. Beginning on Tuesday 11/22/22, lengths of plastic sheeting were placed on the ground on the back side of the gondola railcars to catch any unintended spillage during transload activities. If any soil escaped the gondola during transload, the G&U facility operations team would sweep them up and return the spoils to the railcar before the completed load was sealed and prepared for transport. The use of plastic sheeting on the ground (as well as daily cleanup activities) has continued since these initial events.

Summary of Investigation and Findings

The events described above were discussed and investigated by the NMI project team and our vendors and suppliers to attempt to understand why the truck liners were failing at the G&U transload. A summary of observations and preliminary conclusions are listed below.

- The interior of the truck beds in use were all inspected to ensure no sharp edges, sticking points or other possible hindrances to movement were present. All three truck beds were found to be in satisfactory working condition.
- Two separate liner designs from different vendors were tested to see if perhaps one had defects or a weaker design than the other. Both types of vendor liners were observed to fail using similar means and methods.
- All truck loads originating at the NMI site were within US DOT weight limits (gross weight <80,000 lbs) as well as within the payload design specifications of the truck liners.
- One observed difference with the trucks in use at NMI (versus other types used previously) is the presence of a hydraulic top-hinged gravity opening tailgate. The hydraulic capability allows the tailgate to be fully raised prior to waste offloading (see Figure 1). Standard end-dump truck configurations are equipped with a manual top-hinged tailgate that once unlocked, swings open with gravity as the bed was raised. Project staff believe that not having the 'manual' hinged tailgate available during transload removes inertia introduced by the weight of the manual tailgate while the liner was being offloaded. This inertia aids in slowing the speed of the offload while the bed is being raised. We believe having the hydraulic tailgate fully open during off-load allows the waste to exit the truck at a faster rate, which in turn can lead to higher impact forces when the liner reaches the side and bottom surfaces of the gondola railcar.

Figure 1. Tri-axle Truck with dump bed and hydraulic tailgate option

- The condition of the liners as loaded at the NMI site and as received at the G&U yard appeared normal and appropriate per previous US Ecology and G&U experience. The vendor companies of both type of supplied liners (Pac-Tec, Inc. and Strategic Packaging Solutions [SPS]) were consulted to determine if there were any inadvertent installation errors being made. No significant or obvious errors were immediately pointed out.
- Both liner vendors sent representatives to the project and transload sites on Monday 11/21/22 to observe activities in person. Findings from these visits included:
    - Ensure liners were appropriately installed in the trucks to prevent any potential slippage or binding once the soils were added;
    - Ensure the built-in bag closure mechanisms (zippers and straps) were closed in accordance with the supplied instructions;
    - Have the truck drivers dump the loads as slowly as possible to allow slow and deliberate transfer of the bags from truck to railcar. This is important to limit potential effects due to speed or acceleration when the liners make contact with the awaiting railcar. Each liner contains approximately 20 tons of waste, so impact effects can be significant if care is not taken.
- Beginning on Tuesday, 11/22/22, plastic sheeting was installed on the ground behind the railcars to act as an intermediate barrier to contain any inadvertent spoils that may have escaped the railcar during transload activities. A photo of the plastic sheeting installed on 11/22/22 is provided below.
- Since the initial liner failures were observed, project staff began recording the transloads at the G&U yard so we could study the details of the transload procedures and observe differences between loads where the liners stayed intact and when they failed. We believe we have isolated a few precursors that are contributing to liner failures. The sets of photographs below show incremental steps of a truck-to-rail transload for two trucks at the G&U yard on 11/29/22. The first three

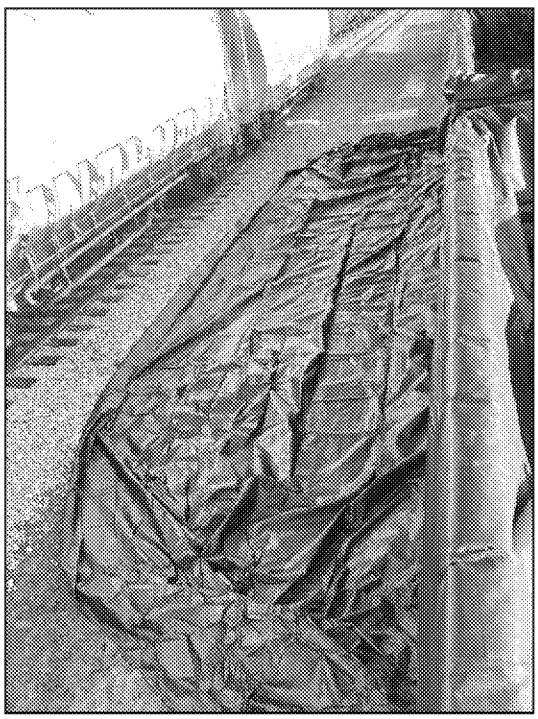
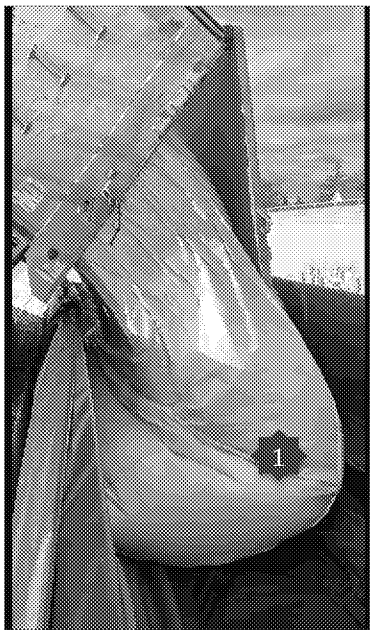


Figure 2. Photo of plastic sheeting used as intermediate barrier at the G&U Railyard

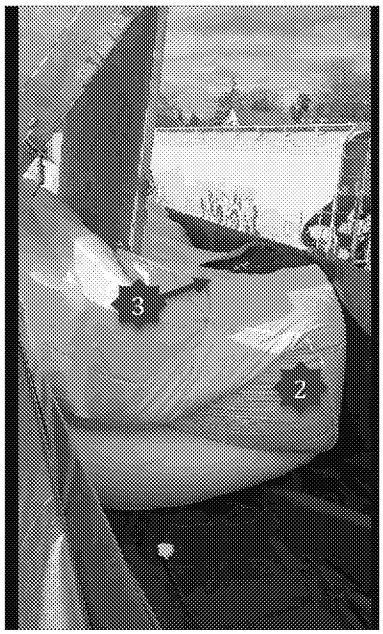
photographs show a liner that fails when being unloaded. The next set of photographs show a successful transload without the liner failing.

***Truck #1* – Liner Failure During Trans-Load**

Initial Waste Offload - Liner and waste begin to exit truck as bed is raised. No issues observed at this point.

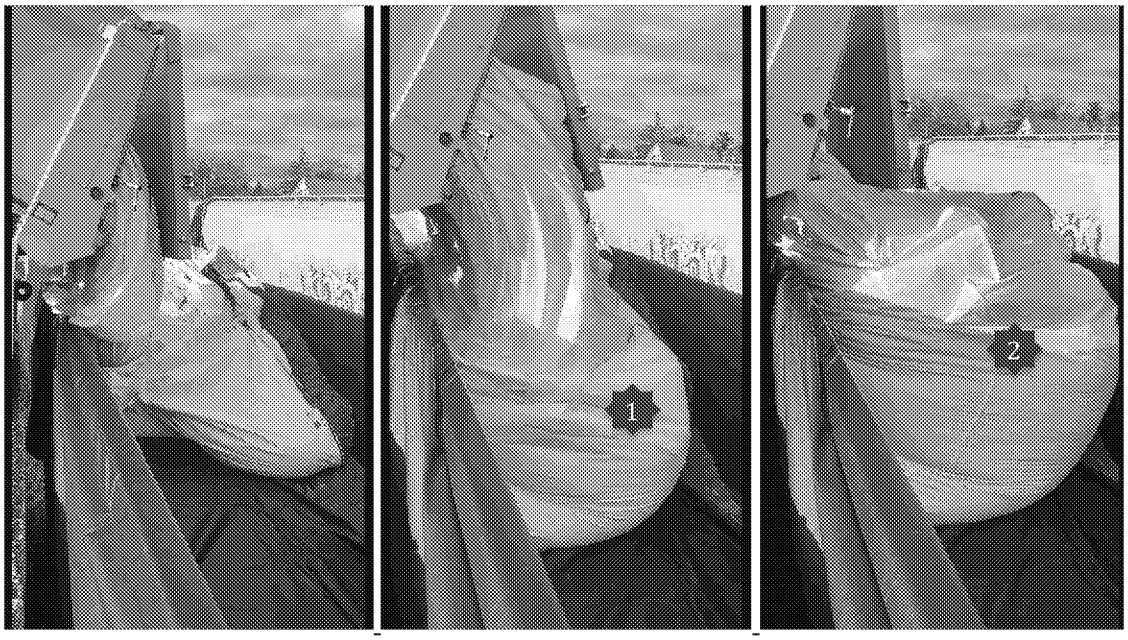


Primary waste transfer - As liner and waste touches bottom of the railcar, liner begins rolling over onto itself. See Note 1 in photo. This crease captures the liner and does not allow movement as waste is being dumped.



Final Waste Transfer – Crease from fold-over is more pronounced (Note 2), causing additional stresses on fabric seams and closures from pressure build-up within liner. Liner fails at the rear wall of the railcar (Note 3).

***Truck #2* – Successful Trans-load with no liner failure**



Initial Waste Offload - Liner and waste begin to exit truck as bed is raised. No issues observed at this point.

Primary waste transfer - As liner and waste touches bottom of the railcar, liner position is stable and waste accumulates evenly within liner and railcar as it is dumped from truck. See Note 1.

Final Waste Transfer – Even waste distribution continues and liner flexes as designed (Note 2) within the width of the railcar. Liner integrity remains intact through final transfer.

Best Understood Root Cause(s)

1. Liners being subjected to stresses beyond their designed engineering limits. If a liner rolls upon itself during off-load, it can lead to binding and pressure build-up within the liner that exceeds the tensile strength of the fabric or supplied closures.
2. The project team also believes that the height of the trans-load ramp may be contributing to the frequency of these failures. At present, the bottom of the dump bed is approximately 10-12" above the wall of the gondola railcars (see adjacent photo). The project team is of the opinion that this additional height leads to the bags exiting the truck at a faster pace, leading to additional stresses on the liners.

Corrective Actions:

1. Immediate Corrective Actions already taken:
   - Starting on the morning of 11/18/22, the NMI site began reducing payload in the end-dump trucks to test impact on bag integrity during transload. Outgoing new payloads from the NMI site were reduced to between 15-20 tons (down from 21-23 tons), with results largely successful. This has not eliminated all liner failures, however.
   - The hydraulic lift on the rear gate of the 'new' dump trucks was disabled. As described above, allowing the rear tailgates to open manually as the beds are raised is advantageous as it slows the overall transload. Although this change has likely brought incremental improvement, it was not found to solve the primary root cause of the liner failures.
   - Truck drivers have been instructed to lift their truck beds as slowly as possible during offloading. Objective is to try and keep the speed of the bag exit as slow as practicable during offload.
   - Alternate (stronger) liner designs are being tested. The Project Team is working with the liner manufacturers to fortify the design and construction of their liners in order to withstand higher shear stresses. NMI expects to be in receipt of new designs to test before the end of the year.
   - Plastic sheeting has been placed on the railbed surface adjacent to the gondola railcars being loaded to collect any future spills until the liner integrity issues have been resolved. This plastic will support easy collection and reloading of any spoils back into the railcar and mitigate the need for future remediation crew deployments.

2. Additional Corrective Actions being planned or considered:

   - The Project Team is considering the implementation of a 'Back Stop' on the far side of the gondola railcar that will serve as a containment measure for the liners and contained soils. Objective is to provide a secondary containment mechanism to ensure all waste remains within the confines of the railcar during truck offloading.
   - The Project Team is also considering a modification to the trans-load ramp at the G&U to lower it approximately 10-12 inches. A decision on this modification has not yet been made.
   - The G&U plans to pour a concrete pad along the back side of the positioned railcar being loaded to facility easy cleanup of any soils that spill from the railcar during transload. This will ensure that any future spills are contained on a solid surface which can be more easily collected and returned to the railcars.

ATTACHMENT A

US Ecology Incident Report (Nov 17, 2022)

US ecology

24 HR Emergency Response Hotline: (800) 839-3975
* DALLAS-FT. WORTH * DETROIT * HOUSTON * MIDLAND *

Incident Report

Date:11/17/22	**Project Number: 163566**	
Caller: Jay Oliva	**USE NERM: N/A**	
Client:	USE 185 Wrentham	
PO/ WO Numbers:		

Incident Location Name:	Hopedale Railyard		
Incident Location Address:		**City/ State/ Zip:**	Hopedale
On Site Contact Name:		**On Site Contact Number:**	

	Operational Period:			
	Date From:	11-17-22	Date To:	11.17.22

Call Received Time:	**Office Departure Time:**	**On Site Time:**	**Return to Office/ End Destination Time:**	**Complete Project Time:**
N/A	**N/A**	**N/A**	**N/A**	**N/A**

Product Spilled:	NON HAZ Dirt				
Amount/ Quantity:	2-3yds				
Container Size/ # Used:		**Total Liquid Waste Generated:**		**Total Solid Waste Generated:**	
Container Size/ # Used:					
Container Size/ # Used:					
Holding Facility		**Address:**			
Landfill Name		**Address:**			
Recycler Name		**Address:**			

US ecology

24 HR Emergency Response Hotline: (800) 839-3975

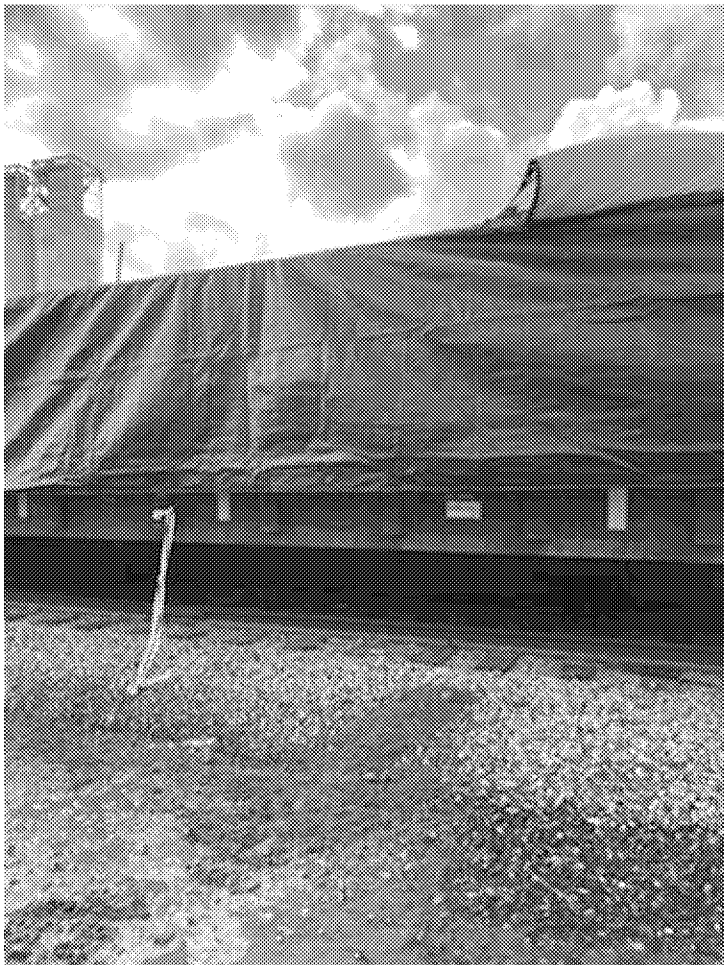
* DALLAS-FT. WORTH * DETROIT * HOUSTON * MIDLAND *

Project Manager: Jay Carvalho			
Email:	Jay.carvalho@usecology.com	**Phone:**	1-401-626-2790

Notable Activities

USE Franklin was called about soil bags breaking while offloading into railcars at the Hopedale Railyard. A crew was dispatched to remove soil from railyard ballast on opposite side of railcar ramp. Operator and tech mobilized with skid steer to clean up soil. 2 bags broke while being offloaded from triaxles into railcars. While the operator was cleaning up soil, he witnessed two more bags break from 2 separate offloads out of triaxles and spill soil into the same area. A total of 4 bags broke. Operator and tech completed clean up and loaded all soil back into rail cans. Checked with railyard attendant and according to operator he was satisfied with response.

Pictures



US ecology

24 HR Emergency Response Hotline: (800) 839-3975

* DALLAS-FT. WORTH * DETROIT * HOUSTON * MIDLAND *

Unequaled service. Solutions you can trust.

USecology.com

US ecology

24 HR Emergency Response Hotline: (800) 839-3975

* DALLAS-FT. WORTH * DETROIT * HOUSTON * MIDLAND *

Unequaled service. Solutions you can trust.

USecology.com

US ecology

24 HR Emergency Response Hotline: (800) 839-3975

* DALLAS-FT. WORTH * DETROIT * HOUSTON * MIDLAND *

Unequaled service. Solutions you can trust.

USecology.com