



# Recycled Glass Used as Alternative Daily Cover in the Northeast US & Quebec Report

COMPLETED BY THE NORTHEAST RECYCLING COUNCIL'S GLASS COMMITTEE  
JULY 2023

## INTRODUCTION & BACKGROUND

The [Northeast Recycling Council, Inc. \(NERC\)](#) is a multi-state non-profit organization committed to environmental and economic sustainability through responsible solid waste management. NERC conducts projects that influence policy and effect change through research, multi-stakeholder processes, technical assistance, demonstration projects, and education. NERC's Board of Directors is comprised of environmental agencies from the 11 Northeast states—Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont. Its Advisory Members include industry, municipal governments, non-profit organizations, and recycling trade associations.

NERC is supportive of growing municipal glass recycling programs and in bolstering end markets for clean glass throughout the region. In August 2017, NERC's Glass Committee was convened with the goals of better understanding the recycled glass value chain and identify gaps in the Northeast, and to also identify NERC's role in promoting the greater diversion of glass containers to the marketplace. Glass Committee members who participated in this Report include:

- Susan Collins, Container Recycling Institute
- Chris Nelson, Connecticut Department of Energy & Environmental Protection
- Rick Watson, Delaware Solid Waste Authority
- Jennifer Heaton-Jones, Housatonic Resources Recovery Authority
- Bret Biggers, Institute of Scrap Recycling Industries
- Justin Short, Institute of Scrap Recycling Industries
- Brooke Nash, Massachusetts Department of Environmental Protection
- Megan Mansfield Pryor, Maine Department of Environmental Protection
- Chaz Miller, Ex Officio NERC Board Member
- Brian Patnoe, Northeast Resource Recovery Association
- Gary Feinland, New York State Department of Environmental Conservation
- Louis Morin, Recyc Quebec
- Kevin Botts, Strategic Materials
- Curt Bucey, Strategic Materials
- Laura Hennemann, Strategic Materials
- Mike Noel, TOMRA
- Pat Grasso, Urban Mining Industries
- Aric Brown, Vermont Agency of Natural Resources
- Bradley Baker, Maryland Department of the Environment
- Timothy Kerr, Maryland Department of the Environment
- Shannon McDonald, Maryland Department of the Environment

Information about the resources developed by the Glass Committee can be found [here](https://nerc.org/projects/current-projects/glass-committee) (<https://nerc.org/projects/current-projects/glass-committee>).

Recycled glass containers have been a focal point in the Northeast US over the past six years due to the significant losses of glass bottle manufacturing and processing facilities in the region. There are two primary sources of recycled glass in the Northeast—bottle bill glass and other glass containers. The glass coming from bottle bill programs is source separated, typically free of contaminants, and is handled separately from other recyclables. It readily finds its way to glass container and fiberglass insulation manufacturers—two end

markets considered to be the highest value added use for recycled glass—although emerging markets including pozzolan are expanding the potential for new high-value applications.

The market situation for post-consumer glass containers not covered by a redemption program is quite different. Non-bottle bill glass is typically collected with other household recyclables and goes through a separation process at dual and/or single stream Material Recovery Facilities (MRFs). Depending on the age of the MRF and the equipment used, the glass going into these facilities may or may not be separated from the other recyclables at the beginning of the sorting line to prevent breakage or further contamination, and may or may not be cleaned or processed to make a more marketable product. (According to a survey conducted by NERC of the Northeast US MRFs, 65% of the respondents reported that they do no additional cleaning of the glass coming from their facilities.<sup>1</sup>)

Generally, the glass coming from MRFs is considered dirty due to the contamination from other materials in the recycling stream such as plastic, paper, metal, or food. This contamination decreases the value of an already low-value material stream. Another contributing factor to the negative value of MRF glass is that the contamination adds weight to the glass, which makes the cost of shipping the material more than 200 miles economically infeasible. Also, MRF glass may be broken into pieces that are smaller than 3/8", making it too small for manufacturers' use.

In addition, the Northeast US lacks beneficiation facilities that accept MRF glass to serve the entire region. Beneficiators clean and process glass, making it into a feedstock for manufacturers. Without these facilities, the region's contaminated MRF glass has no viable market within a reasonable shipping range. As a result, many MRFs are sending their separated glass to landfills to be used for Alternative Daily Cover (ADC)—the lowest value use with the least environmental benefits. Another common end use for collected post-consumer glass is Processed Glass Aggregate (PGA) which is crushed glass used for fill in infrastructure such as road base or embankment stabilization.<sup>2</sup>

NERC's Glass Committee compiled this report to get a better understanding of post-consumer glass containers used as ADC. It contains information from the 11 Northeast US states and Quebec.

## KEY FINDINGS

- 75% of the surveyed states/province reported that post-consumer glass is being used as ADC
- 58% have data about the tonnage of glass used as ADC
- 76% do not recognize post-consumer glass used for ADC as recycling
- 83% requires post-consumer glass to be recycled
- 25% have post-consumer glass disposal bans
- Transparency with the public about what happens with post-consumer glass could be improved in most states

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<sup>1</sup> NERC, Northeast MRF Glass Survey Report, 2018, p. 8, <https://nerc.org/documents/Glass/Northeast%20Recycling%20Council%20-%20MRF%20Glass%20Survey%20Report.pdf>

<sup>2</sup> NRRA, Processed Glass Aggregate Specifications and Approved Uses by New England States

<https://www.nrrarecycles.org/resource-library/processd-glass-aggregate-specifications-and-approved-uses-state-new-england>

## Glass Tonnage Disposed In Landfills

Even in states with robust bottle bills or recycling collection infrastructure, post-consumer glass may end up in the waste stream destined for landfills. While some states have data on the amount of glass sent to landfill as a separate waste stream, other states rely on waste characterization data to estimate the amount of glass in the waste stream bound for landfills<sup>3</sup>. As a result, only a few of the states and one province surveyed were able to estimate the amount of glass ending up in landfills.

<b>DE*</b>	13,437
<b>MD*</b>	99,509
<b>PA*</b>	234,962
<b>VT</b>	1,621
<b>Quebec*</b>	78,000

**States Not Tracking This Data:** CT, ME, MA, NH, NJ, NY and RI

**DE\* Data Source** - [DSWA Statewide Waste Characterization Study FY 2016](#)

**MD\*** - 70% of glass disposed was landfilled directly and 30% was incinerated

**PA\* Data Source** - [PA Waste Characterization Study, October 2022.](#)

**Quebec\*** – Confirmed that glass disposed in landfills is coming from municipal collections.

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<sup>3</sup> Some of the glass data generated from waste characterization studies may include other sources beyond post-consumer glass containers, such as window glass.

## Glass Tonnage Used as ADC

A limited number of states were able to provide data on the amount of glass being sent to landfills specifically for use as ADC. It should be noted that these numbers are separate from those in the table above, which reflect the estimated amount of glass within the waste stream that ended up in a landfill as trash, and not for use as ADC.

Table 2. Estimated Tons of Glass Used as ADC	
DE*	0
MD	0
MA	23,555
NY	25,537
RI	14,000
VT*	0
Quebec*	78,000

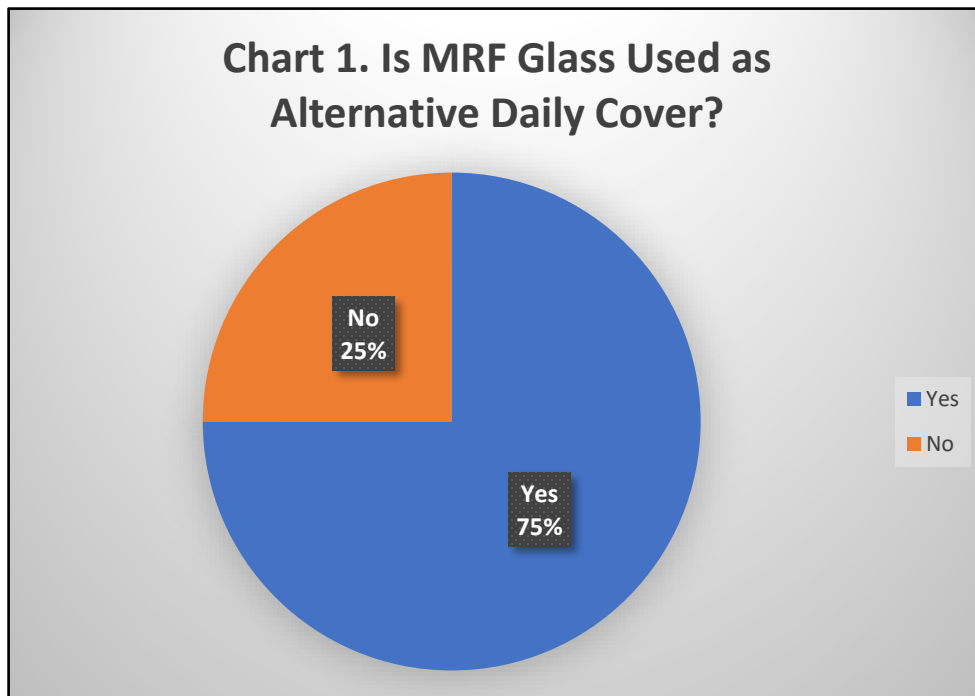
**States Not Tracking This Data:** CT, ME, NH, NJ and PA\*

**DE\*** - There are other available materials used as ADC.

**PA\*** - Approval of glass for ADC is not centralized and is approved by each of six regional offices.

**VT\*** - Ground C&D used for ADC may contain some window glass.

**Quebec\*** – Confirmed that glass used as ADC is coming from MRFs.



**States/Province That Responded Yes:** CT, ME, MA, NH, NJ, NY, PA, RI and Quebec

**States That Responded No:** DE, MD and VT

#### Additional Notes

**CT** - If the glass is less than 3/8", "crushed recycled glass" can be used as daily cover. MRFs may also be sending glass to out-of-state MRFs.

**DE** – No glass is used as ADC. Delaware has plenty of other materials (i.e., treated oil contaminated soils and shredded C & D without wallboard).

**ME** - Non-bottle bill glass may be used as ADC, shaping, or grading within landfills with Department approval.

**MD** - No glass is currently being used as ADC, but it could be if requested and approved.

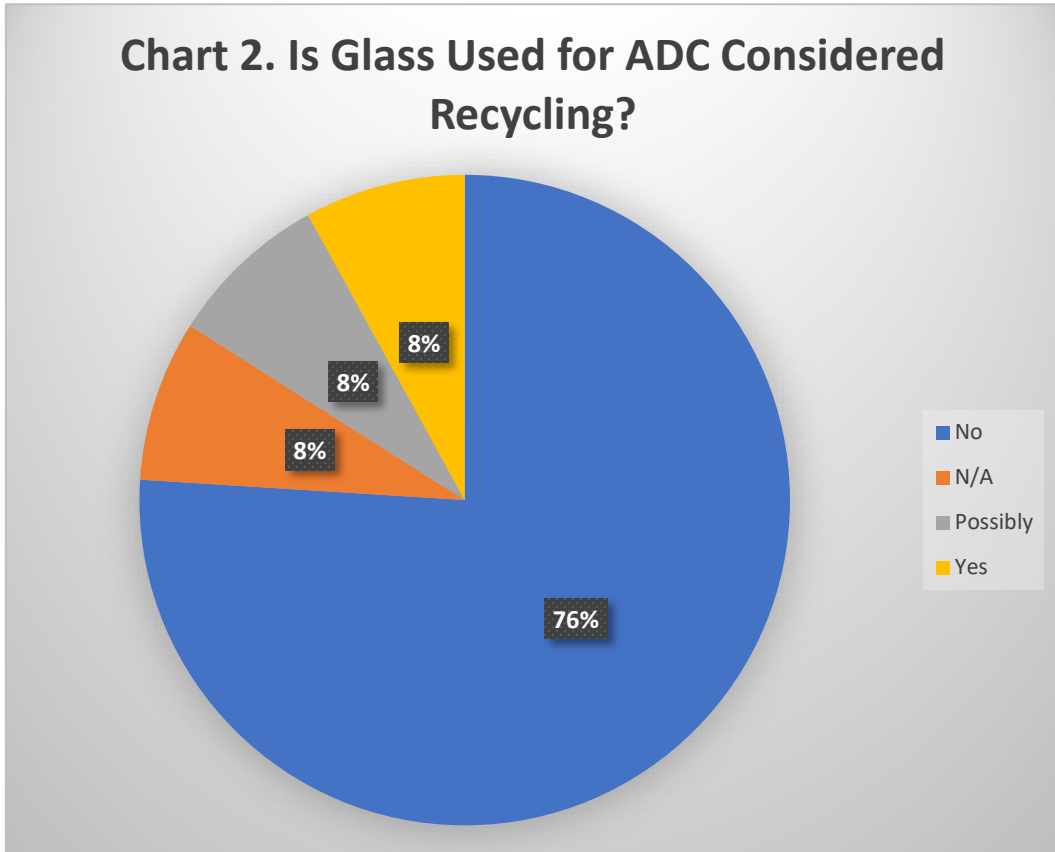
**MA** - Yes, if it meets specification which consists of clean mixed color cullet with a maximum residual content (i.e., food, paper, etc.) of 5% by volume. Glass products other than food or beverage containers (i.e., fluorescent lights, video screens, window panes, etc.) are precluded. The glass must be crushed and screened such that 100% of the material passes a 3/8" screen size.

**NH** - Yes, it is theoretically allowable, but it is incumbent on the facility to develop a specification that meets the performance objectives listed in Env-Sw806.03(a). To date, no NH landfills have developed a specification for the use of glass as ADC.

**NY** - Yes, if meets specifications and there is no reporting requirement.

**VT** - No, but the State allows other uses for PGA in Vermont that may include roadway, trail, parking lot or sidewalk applications; utility trench bedding; backfill material for underground utilities; drainage applications and filter media for wastewater treatment systems.

**Chart 2. Is Glass Used for ADC Considered Recycling?**



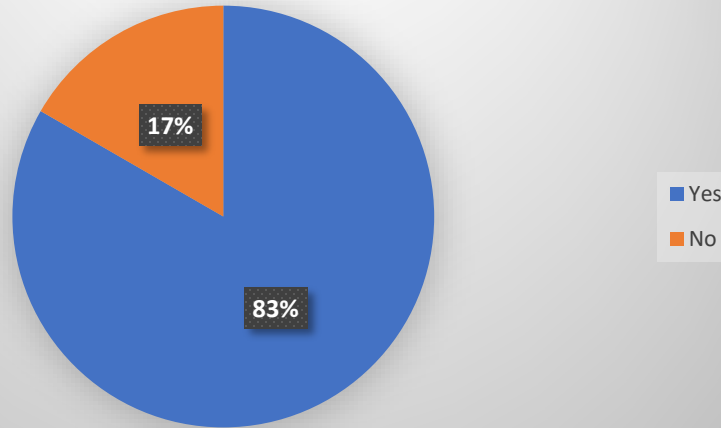
**State That Responded Yes:** MD

**States/Province That Responded No:** CT, MA, NH, NJ, NY, PA, RI, VT and Quebec

**State That Responded N/A:** DE - No glass is used for ADC.

**State That Responded Possibly:** ME - Generally, no, with one exception: as per [38 MRS §1310-N. Solid waste facility licenses](#), solid waste processing facilities may count some of the waste sent to landfills for shaping, grading or alternative daily cover materials toward their minimum recycling requirements.

**Chart 3. Is Glass Recycling a Requirement?**

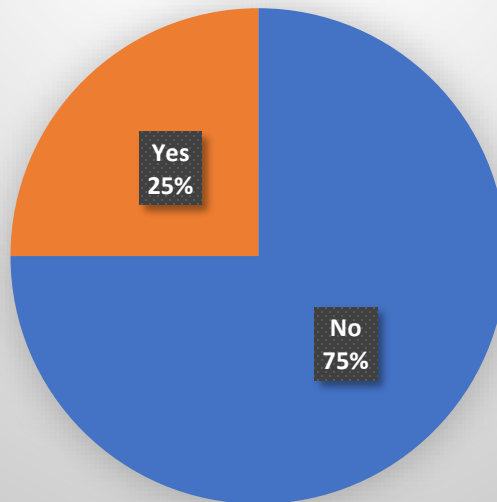


**States/Province That Responded Yes:** CT, DE, ME\*, MA, NJ, NY, PA, RI, VT and Quebec

**States That Responded No:** MD and NH

**ME\*** - Glass containers covered by the Bottle Bill must be recycled.

**Chart 4. Is Glass Disposal Banned?**



**States That Responded Yes:** MA, PA & VT

**States/Province That Responded No:** CT, DE, ME, MD, NH, NJ, NY, RI & Quebec



## Transparency About the End Use of Recycled Glass

Anecdotal discussions amongst NERC Glass Committee members suggest that there may be something of a disconnect between what post-consumer glass is used for after being processed through a MRF, and what the public expects will happen with that material. For example, people may reasonably anticipate that the glass containers they place in their recycling bins will be recycled into new glass containers or used in fiberglass manufacturing, when in reality much of the glass processed through MRFs is sent for a lower-value application such as landfill cover or road bedding. Some states take a proactive approach to ensuring end uses for recycled material are publicly available. Other states could also consider taking a more proactive approach to transparency by specifically stating that end uses for glass vary widely and the public should ask their local recycling program for information if they want to learn what the post-consumer glass collected in their community is used for.

**Table 3. Is There Transparency About the End Use of Recycled Glass with Residents?**

<b>CT</b>	CTDEEP mentions in various places that some glass put in curbside recycling bins by residents may not actually get recycled, but this information is not reaching a broad audience.
<b>DE</b>	DNREC and DSWA provide the general public with information on recycling in many ways including brochures; websites; social media; and displays at various sites, events and educational activities for schools at their sites or at DSWA's Environmental Education Center.
<b>ME</b>	Some recycling programs do publish information on their website stating where the glass goes. People who are motivated to seek out information will be able to determine that non bottle bill glass is most likely being used for fill or stabilization rather than recycled into new bottles.
<b>MD</b>	No, but counties have to recycle either 35% or 20% of waste depending upon population.
<b>MA</b>	Generally, no. Only if it comes up in public webinars or on social media comments; most residents assume their glass is going into new glass containers.
<b>NH</b>	No.
<b>NJ</b>	No.
<b>NY</b>	No.
<b>PA</b>	No response received.
<b>RI</b>	Yes, if anyone asks. We are not publicizing it.
<b>VT</b>	Yes, <a href="https://dec.vermont.gov/content/what-happens-my-stuff">https://dec.vermont.gov/content/what-happens-my-stuff</a> .
<b>Quebec</b>	Yes, it's publicly reported.

**Table 4. State Definitions for Alternative Daily Cover**

<b>CT</b>	<p>From RCSA 22a-209-1: "Cover material" means soil, <b>or other suitable material as approved by the Commissioner</b>, which is used to cover compacted solid waste in a solid or special waste disposal area. Any soils used shall be classified as GM - silty gravels, poorly graded gravel-sand-silt mixtures; GC - clayey gravels, poorly graded gravel-sand-clay mixtures; SM - silty sands, poorly graded sand-silt mixtures; SC - clayey sands, poorly graded sand-clay mixtures; ML, inorganic silts and very fine sands, rock flour, silty or clayey fine sands with slight plasticity in accordance with the unified soil classification system.</p> <p>CGS 22a-208z allows some "crushed recycled glass" (as defined in this statutory section) to be used as cover material.</p>
<b>DE</b>	<p>Same performance requirements/standards of soil.</p>
<b>ME</b>	<p>The Department regulates alternative daily cover proposals under the provisions of Landfill Siting, Design and Operation, 06-096 C.M.R. Ch. 401, § 4(C)(8). In general, "...alternative daily cover must perform as an acceptable substitute for the soil material it is replacing, i.e., it must be able to control nuisance odor, dust, litter, and vectors..." and "...must not exceed 9" in depth after compaction..."</p>
<b>MD</b>	<p>COMAR 26.04.07.10 D: Daily Cover Material. A uniform compacted layer of clean earth at least 6 inches in depth, or an approved cover material of a thickness specified by the Approving Authority, shall be placed over exposed solid waste by the end of each day's operation, or more frequently as may be determined by the Approving Authority. To meet approval, the cover material may not: (1) Contain free liquids, putrescibles, or toxic materials. Moisture which is present in the cover material solely as a result of precipitation is not free liquid. (2) Create a dust or odor problem. (3) Attract or harbor vectors. (4) Impede compaction with standard landfill equipment." We also consider fire and litter suppression when considering ADCM requests. Also, for something that does NOT meet the requirements of items 1-4 above, but for which other practices can be used to counterbalance the performance deficit in a given potential cover material, we can grant a Variance under COMAR 26.04.07.26, Variances, which would require that the additional practices be employed when the alternative material is in use. For example, we approve tarps, but also require more frequent application of soil intermediate cover material to make up for the lesser fire suppression ability of tarps. You can view all of our solid waste regs at <a href="http://www.dsd.state.md.us/COMAR/SubtitleSearch.aspx?search=26.04.07">http://www.dsd.state.md.us/COMAR/SubtitleSearch.aspx?search=26.04.07</a>.</p>
<b>MA</b>	<p>310 CMR 19.130(15)(c) - Daily Cover. 1. Daily cover material shall be workable under all weather and operational conditions. 2. A minimum of six inches of compacted soil shall be applied: a. over all exposed solid waste at the end of each working day; or b. more frequently and/or at greater depth, if necessary, to prevent fire and control vectors, odors, or blowing litter and to ensure that there is no exposed refuse. 3. A minimum quantity of daily cover material sufficient for 14 working days operations shall be stockpiled at the landfill site at all times. 4. Daily cover shall not be used in quantities greater than are necessary to achieve compliance with the requirements at 310 CMR 19.130(15)(a). Any quantity of daily cover used above this amount, except where stipulated, is considered disposal. 5. Upon written request, the Department may approve in writing, the use of alternative daily cover materials and/or different thicknesses of daily cover pursuant to 310 CMR 19.105: Equivalency Review Standards and Procedures. Where non-soil cover materials are proposed the material must meet or exceed the standards established at 310 CMR 19.130(15)(a) and (b).</p>

<p><b>NH</b></p>	<p>ADC – See Env-Sw 806.03(d)(2), excerpted below: (d) Subject to the requirements in (b) above, the following materials shall be approved as working face cover material: 1. Natural soils; and 2. The following alternate materials, provided that use of the material is approved as part of the facility operating plan or approved as a type III permit modification pursuant to Env-Sw 315: a. Geosynthetic tarps; b. Casting sands; c. A waste certified for distribution and use as landfill cover pursuant to the provisions of Env-Sw 1500; and d. Contaminated soil, subject to the requirements of Env-Sw 903.05. For full context, the rules in Env-Sw 800 are accessible here: <a href="https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/Env-Sw%20800.pdf">https://www.des.nh.gov/sites/g/files/ehbemt341/files/documents/2020-01/Env-Sw%20800.pdf</a></p>
<p><b>NJ</b></p>	<p><a href="https://www.nj.gov/dep/dshw/resource/26sch02a.pdf">NJAC 7:26-2A.8(b)15 through 19.</a> - <a href="https://www.nj.gov/dep/dshw/resource/26sch02a.pdf">https://www.nj.gov/dep/dshw/resource/26sch02a.pdf</a> 15. An alternate material other than clean soil proposed for use as daily, intermediate or final cover material at a sanitary landfill shall be subject to the approval of the Department provided the following criteria are met. Further guidance is set forth in the Department’s Technical Manual prepared by the Department’s Bureau of Landfill and Recycling Management for Cover Material Requests: i. The alternate material impedes the entry of rodents and vectors into the waste fill; ii. The alternate material controls malodorous emissions; iii. The alternate material provides a firebreak; iv. The alternate material resists or has limited erosion potential and is not easily wind blown; and v. The alternate material controls windblown litter; 16. The alternate cover material shall meet the following performance standards: i. The volatile solids, or combustible content of the cover shall not exceed 12 percent by weight; ii. No more than 20 percent of fine grained materials shall pass a No. 200 sieve; iii. At least 40 percent by weight of the fragments in the soil admixture shall be capable of passing through a No. 10 mesh sieve; and iv. Particle sizes shall not exceed six inches in diameter; 17. If possessing soil-like properties, the following laboratory testing for the alternate material shall be required depending on the material and its intended use: i. For intermediate or daily cover, the following tests shall be required: (1) Solids content; (2) Percent volatile solids; (3) Grain size analyses; and (4) Moisture content; ii. For final or temporary final cover, the following tests shall be required: (1) Atterburg limits; (2) Permeability testing; (3) Solids content; (4) Percent volatile solids; (5) Grain size analyses; and (6) Moisture content; iii. In addition to the tests at (b)17ii above, materials intended for use in the topsoil layer in a final cover shall require the following tests: (1) Nitrogen; (2) Ammonia-n; (3) Nitrate-n; (4) Total kjeldahl nitrogen; (5) Phosphorus; (6) Calcium; (7) Magnesium; (8) Potassium; and (9) Organic content; 18. Analytical chemical tests may be required for the alternate material depending on the material and its intended use; 19. An evaluation program in accordance with the requirements for RD&amp;D projects as set forth at N.J.A.C. 7:26-1.7(f) shall be conducted for non-traditional cover materials such as cover foams and geotextiles. The evaluation program shall evaluate the cover material in actual use at the landfill. i. The owner and/or operator of a sanitary landfill with an RD&amp;D authorization for non-traditional cover materials shall evaluate the effectiveness of the material in meeting the requirements by monitoring its use under varying operational and weather conditions.</p>
<p><b>NY</b></p>	<p>ADC is referred to as alternative operating cover by the NYSDEC. NY’s definition of operating cover is a compacted layer of soil placed on all exposed waste. Alternative operating cover is the use of waste as operating cover “if the material is capable of meeting the performance criteria for operating cover...” (363-6.21(c)(1). “All wastes intended to be used as AOC must receive written department approval prior to their use. As a condition of approval, the department may require a sampling and analysis plan, including parameters to be tested, test methods, and frequency of testing to ensure compliance with paragraph (1) of this subdivision” (363-6.21(c)(1).</p>

<b>PA</b>	ADC is determined on a case by case basis when issuing an operating permit and/or permit amendment for a disposal facility. Many factors go into whether or not the request for ADC is approved, especially because there are advantages to the disposal facility for almost any material to be approved as ADC.
<b>RI</b>	ADC is usually defined in the permit of the facility accepting it.
<b>VT</b>	From VT DEC 2020 Solid Waste Management Rules: “Alternative Daily Cover” means materials which substitute for compacted soils and earthen materials to cover waste at landfills on a daily basis, and which use has been approved by the Secretary.
<b>Quebec</b>	<a href="#">Article 42 of the provincial by-law.</a>

## CONCLUSIONS

- Without having consistent outgoing materials reporting requirements for MRFs, it’s impossible to generate data about the total tonnage of recycled glass being sent to landfills as trash or diverted for use as ADC in the Northeast region.
- More beneficiation facilities capable of cleaning MRF glass are needed in the region to make the glass economical for use as a manufacturing feedstock.
- Until more investment is made in the glass recycling infrastructure, MRF glass will continue be used as ADC.
- Alternative glass collection models that separate post-consumer glass from other recyclables may be most effective in creating a cleaner stream of material for existing markets.