This project to promote the use of reclaimed glass in base aggregate results from a collaboration among the Minnesota Local Road Research Board, the Minnesota Technology Transfer (T²) Local Technical Assistance Program (TLAP) at the University of Minnesota’s Center for Transportation Studies, the Minnesota Department of Transportation, and the Office of Environmental Assistance.
Counties discover the benefits of using reclaimed glass in aggregate mix

In 1991, Sibley County found itself with a problem not unfamiliar to other counties and recyclers—finding a use for increasing amounts of glass that had nowhere to go but to a landfill at a cost of $60 a ton.

At the same time, the county also continued to look for quality, cost-effective options for aggregate mixes. When the Gaylord Jaycees asked the county to dispose of a 10-ton glass load, it was the beginning of a new solution to both issues.

The county hauled the load to a gravel pit, fed a 10-to-1 ratio of gravel and glass into the crusher, and produced about 100 tons of Class 5 road gravel mix. Sibley sent samples from the mix to the Minnesota Department of Transportation (Mn/DOT) for testing. Mn/DOT’s materials and research laboratory found encouraging results. Research showed that adding glass to gravel actually helped increase the quality of gravel.

A win-win solution

“It proved to be a very successful solution for us,” says Eugene Isakson, at the time the director of Sibley County public works. “It helped us take existing gravel and upgrade it, as well as improve our ability to recycle glass materials.”

After its first test with use of reclaimed glass in aggregate mix, the county completed another project—a 1,200-foot test strip of a four-mile gravel base and bituminous paving project on CSAH 6. This project made it clear that use of reclaimed glass in road construction offered some important advantages.

“Benefits of the procedure appear to be win-win, particularly with the use of substandard sandy gravel, which is very common and available throughout this part of the state,” says Isakson. “The procedure should also provide a market or use for reclaimed glass. Under no circumstances should the type of reclaimed glass detailed in the new Mn/DOT specification be landfilled in the future.”

Q: HOW ARE ENVIRONMENTAL IMPACTS ADDRESSED WHEN USING GLASS AS AN AGGREGATE?

A: As a general rule, properly collected, processed, and stored reclaimed glass poses very little, if any, threat to the environment. For unwashed reclaimed glass, the specification calls for suppliers to stockpile the reclaimed glass on soil that allows for free draining and treatment of organic residual, with a minimum depth to groundwater or bedrock of four feet, a minimum distance of 150 feet away from any surface water body, and a maximum slope of 4 percent to any surface water body.
The next steps

Sibley County demonstrated that reclaimed glass can be competitive in price when compared with that of conventional aggregates. Under the right conditions, crushing and blending virgin aggregate with 10 percent reclaimed glass may help upgrade substandard gravel so that the final product then can meet Mn/DOT specifications.

In the six years since the Sibley County project, the successful use of reclaimed glass in aggregate mix began to grow in counties throughout the state. In 1998, the Research Implementation Committee (RIC) of the Minnesota Local Road Research Board (LRRB) decided to fund an outreach project that supports the application of reclaimed glass material in aggregate mix.

As a result, the LRRB and project co-sponsors, Mn/DOT and the Minnesota Office of Environmental Assistance (OEA), recently undertook two important initiatives—completing the writing of a new specification that includes reclaimed glass as an option for Class 7 aggregate as base course, and developing information/outreach materials on the use of reclaimed glass in aggregate mix.

A Technical Advisory Panel helped with both specification development and information/outreach planning for the project. The panel included the following members: Roger Olson, Duane Young, David Beberg, Greg Johnson, Nancy Sannes, and Bruce Johnson from Mn/DOT; Deborah Carter McCoy formerly from OEA; Keith Cherryholmes from the Minnesota Pollution Control Agency; Larry Feldhahn from Ramsey County; Susan Young and Craig Cooper from the City of Minneapolis; Kevin Adolfs formerly from St. Louis County; Eugene Isakson, former Sibley County engineer; and Dan Krivit from Dan Krivit and Associates.

The Minnesota Technology Transfer (T²)/Local Technical Assistance Program (LTAP) served as the administrative lead for the project, while a Project Implementation Committee (PIC) addressed direct project implementation. The PIC members included Cheri Trenda from Minnesota T²; Micky Ruiz from Mn/DOT Office of Research and Strategic Services; Roger Olson from Mn/DOT Materials Research (“The Maplewood Lab”); Dan Krivit and Gene Isakson, as the technical consultants; Chris Cloutier from the Office of Environmental Assistance; and Darlene Gorrill, communications consultant for Minnesota T².

Implementation of the reclaimed glass-to-aggregate project will help ensure that all interested city and county engineers are contacted. Technical consultants Krivit and Isakson will continue to disseminate information through “one-on-one” field contact, conferences, meetings, and other venues.

Questions? Please use the contact list on page 3 for the professionals who can help answer your questions.

Q: WHAT KINDS OF RECLAIMED GLASS ARE RECOMMENDED FOR USE IN AGGREGATE MIX?

A: Mixed-color container glass from consumer foods and beverages, ceramic and china dinnerware, and windows from buildings.

Because they contain hazardous materials or are too difficult to process, some types of glass should not be used in aggregate mix. Those types include car windshields, other car glass, light bulbs, porcelain, laboratory glass, and glass from television sets and computers.
The official Mn/DOT specification that includes the use of reclaimed glass in aggregate mix

In spring 1999, Mn/DOT issued a new specification with some key new features:

- The specification includes the use of 10 percent reclaimed glass in aggregate material for road base.
- It also creates a new class of aggregate material—known as Class 7—which represents aggregate mixtures that contain salvaged/recycled aggregate materials.
- It allows contractors to include the use of reclaimed glass in their bid unless the purchasing government agency specifically excludes use of reclaimed glass in their written project specifications. In the bid, the contractor must specify that they used reclaimed glass to produce Class 7 aggregate that meets the Mn/DOT specification’s quality standards.

With an increasing number of counties using reclaimed glass in their aggregate mix, the timing was right for Mn/DOT to develop a formal specification that officially paves the way for reclaimed glass. The specification provides details on its use. The following list summarizes other highlights from the specification.

- Crushing operations shall produce a well-graded product.
- Combined aggregate, or traditional aggregate plus reclaimed glass, shall meet the requirements of Mn/DOT specification 3138.
- Combined aggregate using reclaimed glass shall not be used for surfacing aggregate including shoulder surfacing.

Mn/DOT distributed copies of the Technical Memorandum 99-08-MRR-04, which includes the...
A primer on reclaimed glass

Q: What are the benefits of using reclaimed glass in aggregate?
A: Counties that use reclaimed glass in aggregate report several benefits:

• The use of reclaimed glass may help some counties reduce the cost of road construction. Cost savings depend on the quality of virgin aggregate used.
• It offers counties a way to help recycle locally a portion of their solid waste, thus eliminating landfill costs, as well as reducing the need for purchasing virgin material. In total, these actions can translate into economic benefits.
• Research and field results show that using reclaimed glass in the aggregate per the specification results in a product of equal or better quality. Reclaimed glass also enhances the permeability of the base.

Q: How difficult is reclaimed glass to use in aggregate mix?
A: It’s not. Contractors use the same crushing process with the same equipment to produce aggregate mix with reclaimed glass.

At a 10 percent maximum, the amount of reclaimed glass in the aggregate mix is minimal. Reclaimed glass is available either through county or private glass suppliers. This information kit includes a list of glass suppliers throughout the state.

With proper pre-planning and coordination, the glass easily can be incorporated into county construction plans. For example, glass can be stockpiled for several years in preparation for the next scheduled road construction project in the area.

Q: Does reclaimed glass need to be pre-processed before it is blended into aggregate?
A: No. Some counties have used dedicated glass crushers and screens to remove debris, but this is not required. The most economical approach is to stockpile in “whole bottle” form for blending/crushing in the normal aggregate crushing operations.

Q: Won’t reclaimed glass smell and contain residues that wash into the environment?
A: Glass suppliers need to meet environmental requirements to ensure clean glass that is free of harmful substances. Counties, recyclable collection companies, and recyclable processors need to work together on quality assurance.

Recyclers should provide written certification to counties or aggregate producers that the reclaimed glass contains no hazardous or toxic substances. This information kit includes a sample of a certification letter and more information about environmental issues.

Q: Don’t the aggregate and the reclaimed glass stock need to be stored separately?
A: The specification notes that “the composite mixture may be produced from any combination of
these salvaged/recycled aggregate materials.” It does not require separate inventories of feedstock supplies or final product.

Q: What does this mean for aggregate producers?
A: Aggregate producers that develop relationships with suppliers of reclaimed glass can gain a competitive advantage, especially if bid specifications require the use of reclaimed glass in aggregate base in bids. Also, virgin aggregate is conserved and, in some cases, lower quality, sub-standard virgin feedstock can be brought up to gradation specifications by utilizing 10 percent glass.

Q: What about public reaction? Doesn’t including reclaimed glass in aggregate mix cause some concern?
A: Past experience indicates that the general public understands and supports this concept. The use of reclaimed glass offers the advantage of reducing a portion of material that otherwise would go to a landfill. That benefit fits well with the commitment of counties and cities to environmental and economic responsibility.

The news media have reported on the use of reclaimed glass in aggregate mix in Otter Tail County, helping to increase the awareness about the positive aspects of reclaimed glass use in road construction.

Q: Who is using reclaimed glass?
A: More than 15 Minnesota counties have used reclaimed glass in aggregate mixes for road construction, including Sibley, Hennepin, Ramsey, Cass, Otter Tail, and St. Louis Counties.

This interest in reclaimed glass has grown over the past few years and helped contribute to the development of a formal specification.

Q: What other alternative uses are there for glass?
A: Anchor Glass Corp. in Shakopee, Minn., continues to recycle more than 60,000 tons per year of glass, but it must be sorted by color and no ceramics or window glass are allowed. Other alternative markets are under development, such as using reclaimed glass as a sandblast medium or for glass tiles. It is hoped that these will become higher value, commercially available outlets in the future. In the meantime, using glass as an aggregate supplement for road base is proven, accepted by Mn/DOT, and economically feasible.

There’s glass, and then there’s glass

Exactly what kinds of reclaimed glass does the Mn/DOT specification permit for use in aggregate mix?

The list includes container glass for consumer food and beverages; ceramic or china cups and plates; and plate ‘flat’ glass. Sources of glasses include residential and commercial generators.

The specification prohibits glass from cars, glass from light bulbs, and glass with known hazardous characteristics as defined by Minnesota Pollution Control Agency rules.

No matter whether container or flat glass, all recyclers must institute product quality control procedures and inspect glass sources. City and county engineers may choose to inspect the inventories of reclaimed glass stockpiles.

What other resources exist?

Please check the folder pocket of this brochure for additional information. For assistance in locating other sources, contact the Mn/DOT Library at 651/296-2385 or the Center for Transportation Studies Library at 612/626-1023.

Q: HOW DOES THE SPECIFICATION ADDRESS CONCERNS OVER DEBRIS IN THE RECLAIMED GLASS?
A: The specification requires that reclaimed glass “shall not contain more than 5 percent debris,” which includes any non-glass material such as paper, foil, plastics, metal, corks, wood debris, food residue, or other deleterious materials.
Guidelines for estimating debris

The guidelines that follow offer a convenient method for helping determine the readiness of reclaimed glass for use in an aggregate mix. Debris is defined in the Mn/DOT specification as any non-glass material, such as paper, foil, plastics, metal, corks, wood debris, food residue, or other deleterious materials. This is an abbreviated guide to the method. For a full set of charts, contact Mn/DOT's Office of Research and Strategic Services at 651/282-2274.

Sampling

- Follow normal aggregate sampling procedures in the Mn/DOT Grading and Base Manual. For a copy of the manual, contact Mn/DOT Map and Manual Sales at 651/296-2216.
- When shipping and storing whole bottles at gravel pits, sample the glass within the glass pile before crushing and blending.
- Or when crushing and screening glass before blending, sample the glass coming off the screen.
- Conduct one visual inspection estimate for debris for every 50 cubic yards of reclaimed glass and conduct a general examination of the entire reclaimed glass lot before collecting samples.
- Collect field samples on a random basis.
- If the glass is in “whole bottle” form (without any pre-processing), about 40 pounds should be collected per sample.
- If the glass has been pre-crushed and/or screened, only about 10 pounds is needed per sample because it will be more uniform.

Visual inspection and estimation

- Use an eight- to 10-inch visual test pan that is one to two inches deep.
- If you plan to use “whole bottles” directly as your feedstock, break the containers into smaller pieces (e.g., one-inch minus) so the sample will fit into the test pan.
- Place one to three pounds of reclaimed glass in the test pan and level the sample.
- Compare the amounts of debris in the test pan with the standard reference charts on page seven. Remember to disregard the glass and compare only the unattached debris with the reference charts. (Charts are used with permission of the Society for Sedimentary Geology.)

Data

- It’s helpful to keep a log of visual inspection results. Write down the sample date, shipping date, destination, percentage of debris, type of glass, source of glass, description of glass, sample location, uniformity of batch, sample size reduction procedures, and names of those collecting sample and conducting visual test. Keep the log on file for future reference.
Q: WHO CAN I CALL WITH QUESTIONS ABOUT ENVIRONMENTAL CONCERNS?

A: Contact the Minnesota Office of Environmental Assistance at 651/296-3417.
Questions?

Please use the following contact list for the professionals who can help answer your questions.

For technical questions about use of reclaimed glass, contact one of Mn/DOT’s District Material Engineers:

<table>
<thead>
<tr>
<th>Name</th>
<th>Phone</th>
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<tbody>
<tr>
<td>Rod Garver, District 1, Duluth</td>
<td>218/723-4830</td>
</tr>
<tr>
<td>Graig Gilbertson, District 2, Bemidji</td>
<td>218/755-3807</td>
</tr>
<tr>
<td>Tony Kempenich, District 3, Brainerd</td>
<td>218/828-2481</td>
</tr>
<tr>
<td>Lori Vanderbider, District 4, Detroit Lakes</td>
<td>218/846-0743</td>
</tr>
<tr>
<td>Mike Rief, District 6, Rochester</td>
<td>507/285-7383</td>
</tr>
<tr>
<td>Steve Oakey, District 7, Mankato</td>
<td>507/389-6951</td>
</tr>
<tr>
<td>Art Bolland, District 8, Willmar</td>
<td>302/231-5195</td>
</tr>
<tr>
<td>Willis Enloe, East Metro, Oakdale</td>
<td>651/779-1111</td>
</tr>
<tr>
<td>Joe Korzilius, West Metro, Golden Valley</td>
<td>612/797-3019</td>
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For technical information about implementation issues, contact:

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<th>Name</th>
<th>Phone</th>
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<tr>
<td>Dan Krivit, Dan Krivit and Associates</td>
<td>651/489-4990, <a href="mailto:dkrivit@bitstream.net">dkrivit@bitstream.net</a></td>
</tr>
<tr>
<td>Gene Isakson</td>
<td>507/934-3513</td>
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For questions about the Mn/DOT Class 7 specification and applications, contact:

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<tr>
<th>Name</th>
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<tbody>
<tr>
<td>Duane Young, Mn/DOT</td>
<td>651/779-5564</td>
</tr>
<tr>
<td>David Beberg, Mn/DOT</td>
<td>651/779-5608</td>
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For questions about other glass studies and market development projects in Minnesota or environmental issues, contact:

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<thead>
<tr>
<th>Name</th>
<th>Phone</th>
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<tbody>
<tr>
<td>Minnesota Office of Environmental Assistance</td>
<td>651/296-3417 or 800/657-3843</td>
</tr>
<tr>
<td></td>
<td><a href="http://www.moea.state.mn.us">www.moea.state.mn.us</a></td>
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Experiences of counties with reclaimed glass use in aggregate mix prove successful

The Minnesota Office of Environmental Assistance (OEA) surveyed counties in 1998 about their use of or interest in using reclaimed glass in aggregate mix. Of the 52 counties that responded, 28 of those counties indicated that they had used, were using, or were interested in using reclaimed glass in aggregate. Brief case studies of several of those counties with experience in use of reclaimed glass in aggregate mix follow.

**Cass County**

Before 1998, the operator of Cass County’s Pine River recycling center sorted nearly all glass by color and shipped it to Anchor Glass Corp. in Shakopee, Minn., for recycling into new glass containers. In 1998, the county’s new contractor started to stockpile broken glass, in mixed-color form, at a nearby gravel pit. The county later used this stockpile of mixed-broken glass for blending into aggregate on a county road construction project.

A cost-benefit analysis shows that Cass County now saves an estimated rate of about $1,500 per year by producing aggregate locally from their glass, compared with color sorting all glass for marketing to Anchor Glass, equivalent to a unit savings of about $5 per ton. For more information, contact the Minnesota Office of Environmental Assistance at 651/296-3417.

**Hennepin County**

Hennepin County received a grant from OEA to incorporate crushed glass in road base aggregate on the shoulders of County Road 47 in Plymouth, Minn. The mixing of glass with aggregate improved the aggregate’s permeability and strength. Laboratory results also indicated that the material performed slightly better in freezing and thawing conditions.

The success in that project led the county to test the use of crushed glass as a partial aggregate amendment in asphalt. In 1996, the county blended 5 percent crushed glass as part of the bituminous asphalt wear course on an adjacent stretch of County Road 47. It worked so well that the county again in fall 1997 specified the use of 5 percent crushed, screened glass in the asphalt for construction of a parking lot and driveway at its new Public Works Center. For more information, contact Paul Kroening at 612/348-6358.

**Houston County**

Using reclaimed glass in gravel mixes helped Houston County recycle glass locally. The county used this application for its glass to avoid high transportation costs, fluctuations in glass container market prices, and the separation of glass. Houston County used a mixture of glass and gravel for Class 5 aggregate. For more information, contact Rick Frank at 507/724-5800.
LAKE OF THE WOODS COUNTY

Rural counties, such as Lake of the Woods, often find the separation of glass an expensive and resource-intensive process. As an alternative to hauling glass to the Twin Cities, the county decided to blend glass with local aggregate for use in road construction subgrade. Again, Lake of the Woods found that the mixture not only helped them solve their hauling issues, but also improved the natural aggregate. For more information, contact Gary Lockner at 218/634-1945.

OTTER TAIL COUNTY

Otter Tail County also wanted alternatives for their glass recycling program and began exploring the use of glass in Class 5 aggregate. In addition to mixed container glass, the county accepts windows, Pyrex, and Corning Ware. It does not accept appliance glass, windshields, or glass from light bulbs for the mix.

In September 1998, the Otter Tail County Solid Waste Department and the Otter Tail County Highway Department sponsored a demonstration, where the county blended glass during the crushing operations with gravel aggregate. The county then placed the subsequent mix as aggregate base for CSAH No. 74 near Amor, Minn. The Minneapolis-based television station, KARE-11, featured a segment on the demonstration. For more information, contact Marie Tysdal at 218/739-2271.

RAMSEY COUNTY

In 1997, Ramsey County successfully used crushed, screened glass in its Larpenteur Avenue reconstruction project. The county specified a six-inch, Class 6 aggregate base and used 5 percent reclaimed glass in the mix. County and state engineers and the general contractor expressed approval at the glass-blended final product.

In 1998, the county specified use of reclaimed glass directly in the first three-inch layer of the two-foot subgrade without pre-blending for the 1998 portion of the Larpenteur project. The county tested the material, known as select granular borrow, and found it can be suitable. However, in 2000, the county decided to stay with the Class 6 aggregate blend as the preferred application for reclaimed glass because of greater quality control provided by the aggregate producer and the new state specification for Class 7 as road base. For more information, contact Larry Feldhahn at 651/483-5206.
We are a recycling company that is responsible for a certified supply of reclaimed glass to you for your further processing and blending as a feedstock in your production of Class 7G aggregate for use as a base course. This letter certifies that we have met all our requirements as a supplier of reclaimed glass pursuant to Mn/DOT specification 3138 (as released under Mn/DOT Technical Memorandum No. 99-08-MRR-04).

Specifically, we hereby certify that all the reclaimed glass that we supply to you:

1. Is reclaimed from container glass used for consumer food and beverages, beverage drinking glasses, plain ceramic or china dinnerware, building window glass free of any framing material, and/or other types of glass that have been certified and approved by Mn/DOT’s Office of Environmental Services on an individual source basis. If we have supplied other types of glass, we have attached the written certification and approval from Mn/DOT, or it is maintained in our files and available upon request.

2. Does not consist of the following types of materials: any hazardous waste as defined in MPCA Rules 7045, hazardous substance in regulated quantities listed in 40 CFR, Table 302.4, automobile windshields or other glass from automobiles, light bulbs of any type, porcelain products, laboratory glass, and television, computer, or other cathode ray monitor tubes.

3. Does not contain more than 5 percent debris by visual inspection. Debris includes any non-glass material such as paper, foil, plastics, metal, corks, wood debris, food residue, or other deleterious materials. We have used methods to estimate debris levels that are consistent with specification 3138, recommendations by Mn/DOT, and the guidelines listed in the Reclaimed Glass Information Kit, issued by the Minnesota Technology Transfer (T²)/LTAP Program at the Center for Transportation Studies.

4. Has been stored in stockpile locations with minimum of 1.2 meters (four feet) depth of suitable soils separating groundwater, a minimum of 50 meters, or 150 feet, away from any surface water body, and a maximum slope of 4 percent if sloped to any surface water body.

To further control the sources, types, and quality of our reclaimed glass supply, we hereby certify that:

5. A good faith effort of public education was used to inform residents and businesses of the eligible and prohibited types of glass to be included for recycling.

6. Our independent sources of reclaimed glass, such as private recyclables haulers, have been notified in writing of these composition and public education requirements and have agreed in writing to comply with them. Further documentation is on file in our offices and available upon request.
RECLAIMED GLASS SUPPLIERS

This list was published by the Minnesota Technology Transfer Program as a convenience to local agency staff and aggregate producers trying to locate possible sources of reclaimed glass for use as an aggregate supplement. This list does not constitute an endorsement or recommendation by the Minnesota Technology Transfer Program. No guarantee or warranty of the reclaimed glass supply amount or quality is implied or provided. Any reclaimed glass supplier that would like to be included in the next edition of this list may do so by simply calling the Minnesota Office of Environmental Assistance at 651/296-3417. Please be advised that this information changes frequently. Readers are advised to call the recycling center for verification and updated data.

AITKIN COUNTY
Aitkin County Recycling Center
DuWayne Konewko, Director of Environmental Services
Owner: Aitkin County
209 N.W. Second Street
Aitkin, MN  56431
218/927-7250
218/927-4372 (fax)
E-mail: aitkinpz@co.aitkin.mn.us

Garrison Disposal Co.
Tom Bedard, Plant Manager
PO Box 277
Aitkin, MN  56431
1/800/642-0161
218/927-3338 (fax)

BIG STONE COUNTY
Strege’s Recycling Center
Dean Strege
5 N.W. First Street
Ortonville, MN  56278
320/389-2579
320/839-3372 (fax)

CASS COUNTY
Cass County Recycling Center
Paul Fairbanks, Director, Environmental Services Department
Cass County
PO Box 3000
County Courthouse
Walker, MN  56484
218/547-7287
218/547-2440 (fax)

Stockman Transfer
Brad Stockman
1350 S.W. 24th Street
Pine River, MN  56474
1/888/910-2425, press 3
218/587-3506 (fax)

CHISAGO COUNTY
Croix Valley Pick-Up
Dan Dreckman
PO Box 424
Chisago City, MN  55013
651/257-6316
651/257-6316 (fax)

CLEARWATER COUNTY
Clearwater County Recycling Center
Daniel Hecht, Environmental Services
Clearwater County
213 North Main Avenue
Department 206
Bagley, MN  56621-8304
218/694-6183
E-mail dan.hecht@state.mn.us

Clearwater County Recycling Center
Don Bloofat
PO Box 29
Bagley, MN  56621
218/694-6541
218/694-3799 (fax)

COOK COUNTY
Cook County Recycling Center and Drop-Off
Tim Nelson, Solid Waste Administrator
Cook County Office of Planning and Zoning
411 West Second Street
Grand Marais, MN  55604
218/387-3000, extension 133
218/387-3042 (fax)
E-mail: tim.nelson@co.cook.mn.us

DODGE COUNTY
Dodge County Recycling Center
Mark Gamm, Environmental Quality Director
22 Sixth Street East
PO Box 337
Mantorville, MN  55955
507/635-6273
507/635-6265 (fax)
DOUGLAS COUNTY
Waste Management
Jeff Radermacher
PO Box 457
Alexandria, MN  56308
320/762-1118
320/762-1374 (fax)

FILLMORE COUNTY
Fillmore County Resource Recovery Composting and Recycling Facility
Jan Martin, Solid Waste Officer
Fillmore County Courthouse
PO Box 655
Preston, MN  55965
507/765-4704

GOODHUE COUNTY
Goodhue County Materials Recovery Facility
Myrna M. Halbach
509 West Fifth Street
Red Wing, MN  55066-0408
651/385-3101
651/385-3258 (fax)
Land Use Management Department
Marilyn Majerus
PO Box 408
Red Wing, MN  55066
651/385-3109
651/385-3106 (fax)

HENNEPIN COUNTY
Boone Trucking Inc.
Joe Boone
1516 Marshall Street N.E.
612/331-4952
612/331-4928 (fax)
BFI Recyclery
Browning-Ferris Industries
725 North 44th Avenue
Minneapolis, MN  55412
612/522-7967
612/522-7608 (fax)
Hennepin County Recycling Center and Problem Waste Drop-Off
Bob Thomas
Hennepin County
417 North Fifth Street
Minneapolis, MN  55401-1309
612/348-4046
Recycle America—Waste Management, Inc.
Recycling Center
Steve Rehbein
8000 Powell Road
St. Louis Park, MN  55343
612/938-7262
612/938-6145 (fax)

HOUSTON COUNTY
Houston County Recycling Center
Rick Frank
Houston County
304 South Marshall
Caledonia, MN  55921
507/724-5800
507/724-5550 (fax)

KANDIYOHI COUNTY
Kandiyohi MRF
PO Box 1123
1400 S.W. 22nd Street
Willmar, MN  56201
612/231-6229
612/938-6145 (fax)

KOOCHICHING COUNTY
Koochiching County Transfer Station
Dale Olson and Greg Williams
Koochiching County Courthouse
715 Fourth Street
International Falls, MN  56649
218/283-6257

LAKE COUNTY
Lake County Recycling Center
Alan Goodman, Engineer and Solid Waste Officer
Lake County Highway Department
1513 Highway 2
Two Harbors, MN  55816
218/834-8380
218/844-8384 (fax)

LAKE OF THE WOODS COUNTY
Lake of the Woods Co. Recycling
Gary Lockner
Box 808
Baudette, MN  56623
218/634-1945
218/634-2590 (fax)
**MCLEOD COUNTY**
Witte Sanitation & Recycling Inc.
Galen Witte
1330 Pryor Avenue N.
Glencoe, MN  55336
320/864-4454
320/864-2936

**MILLE LACS COUNTY**
Stemf’s Auto
31433 U.S. Highway 169
Onamia, MN  56359
651/532-3987
651/532-3087 (fax)

**MORRISON COUNTY**
A-1 Joe Otremba Disposal
Joseph Otremba
PO Box 146
Little Falls, MN  56345
320/584-5204

**MOWER COUNTY**
Mower County Comprehensive Recycling Program
Jeffrey A. Weaver
Mower County
1111 N.E. 11th Ave.
Austin, MN  55912
507/437-9551
507/437-9582 (fax)

**NICOLLET COUNTY**
North Mankato Materials Recovery Facility
Larry Beiderman, Facility Manager
1139 Center Street
North Mankato, MN  56003
507/625-1199
507/625-7261 (fax)

**NOBLES COUNTY**
Schaaps Recycling
Jesse Leopold
R.R. 4, Box 13
Highway 60 South
Worthington, MN  56187
507/376-3298
507/376-6254 (fax)

**NORMAN COUNTY**
Norman County Recycling Center
Kevin Ruud, Environmental Services Office
Owner: Norman County
16 East Third Avenue, Room #102
Ada, MN  56510
218/784-5493
218/784-3729 (fax)

**OLMSTED COUNTY**
Olmsted County Recycling Center
Steve Winter, Recycle Minnesota Resources/Waste Management, Inc.
305 Silver Creek Road
Rochester, MN  55904
507/252-8505
507/252-8479 (fax)

**OTTER TAIL COUNTY**
Otter Tail County Recycling
Rick Denzel
1115 North Tower Road
Fergus Falls, MN  56537
218/736-4400
218/739-3721 (fax)

**PENNINGTON COUNTY**
SWIS of Pennington County
Rick Nordhagen
13755 Highway 32 S.
 Thief River Falls, MN  56701
218/681-7177

**PIPESTONE COUNTY**
Van Dyke Sanitation
Norm Van Dyke
R.R. 1, Box 131
Edgerton, MN  56128
507/442-7241

**POLK COUNTY**
ODC, Inc.
F. Rory Harger
245 Fifth Avenue S.W.
Crookston, MN  56716
218/281-3326
218/281-2115 (fax)

**RAMSEY COUNTY**
E-Z Recycling
Chris Reinhardt
875 N. Prior Avenue
St. Paul, MN  55104
651/644-6577
Ramsey County Recycling Center
Zack Hansen, Solid Waste Manager
Ramsey County Solid Waste Division
Department of Public Health
1670 Beam Avenue, Suite B
Maplewood, MN  55109-1129
651/773-4440
651/773-4454 (fax)
E-mail: zack.hansen@co.ramsey.mn.us

Ramsey County Recycling Center
Tom Glander
Super Cycle/Waste Management, Inc.
775 Rice Street
St. Paul, MN  55117-5433
651/224-5081
651/224-0315 (fax)

RICE COUNTY
Rice County Recycling Center
Michael Cook, Director
Rice County Department of Waste Management
3800 East 145th Street
Dundas, MN  55019
507/332-6833

ST. LOUIS COUNTY
Howard Wastepaper, Inc.
D. Scott Howard
414 West 59th Avenue
Duluth, MN  55807
218/628-2388
218/628-2389 (fax)

SHERBURNE COUNTY
Superior Services
2355 S.E. 12th Street
St. Cloud, MN  56304
1/888/251-8919
320/251-7113 (fax)

SWIFT COUNTY
Swift County Composting and Recycling Facility
Scott Collins, Director
1000 Industrial Drive
PO Box 288
Benson, MN  56215
320/843-2356
320/843-2275 (fax)

WADENA COUNTY
Wadena Co. Recycling Center
Greg Kempf
County Courthouse, Room 139
Wadena, MN  56482
218/631-4455
218/631-2428 (fax)

WASECA COUNTY
Waseca County Recycling Center
Waseca County Solid Waste Office
31080 State Highway 13
Waseca, MN  56093-5624
507/835-0664
507/835-0633 (fax)

WATONWAN COUNTY
Curry Sanitation
Robert Curry
112 Seventh Street S.
St. James, MN  56081
507/375-3030
507/375-4143 (fax)

WILKIN COUNTY
Wilkin Co. Recycling
Bruce Poppel
515 South Eighth Street
Breckenridge, MN  56520
218/643-5815
218/643-5251 (fax)

WINONA COUNTY
Winona ORC Industries Inc.
Richard Iverson
1053 East Mark Street
Winona, MN  55987
507/452-1855
507/452-1857 (fax)

South East Minnesota Recyclers Exchange (SEMREX)
856 Fifth Avenue S.E.
Rochester, MN  55904
507/252-0750
507/252-9536 (fax)

NORTH DAKOTA
Minnkota Recycling
Terry Horst, Plant Manager
PO Box 1864
Fargo, ND  58107
701/293-8428, extension 11
701/293-0813 (fax)

WISCONSIN
Dennis Perich
1425 Oakes Avenue
Superior, WI  54880
715/394-2174
715/394-7902
RECLAIMED GLASS REFERENCES

The following sources offer more information about the use of reclaimed glass in aggregate. For assistance in locating these and other sources, contact the Minnesota Department of Transportation (Mn/DOT) Library at 651/296-2385 or the Center for Transportation Studies Library at 651/626-1023.

Andela Tool & Machine web site: www.recycle.net/andela

Clean Washington Center, Using Recycled Glass as Construction Aggregate: A Summary of the Glass Feedstock Evaluation Project, a brochure summarizing project results

Clean Washington Center, Best Practices in Glass Recycling, October 1997

Clean Washington Center, Glass Feedstock Evaluation Project, by Dames & Moore


Solid Waste Management Coordinating Board (SWMCB) of the Twin Cities Metropolitan Region in conjunction with the Minnesota Office of Environmental Assistance (OEA) and the Minnesota Department of Administration, Environmentally Preferable Purchasing Guide, “Road Aggregate” fact sheet within the chapter on “Vehicle and Road Maintenance,” April 2000

Debris charts

ReClaimed Glass

Debris Charts
Guidelines for estimating debris

These guidelines offer a convenient method for helping determine the readiness of reclaimed glass for use in an aggregate mix. Debris is defined in the Mn/DOT specification as any non-glass material, such as paper, foil, plastics, metal, corks, wood debris, food residue, or other deleterious materials. This is an abbreviated guide to the method. For a full set of charts, contact Mn/DOT’s Office of Research and Strategic Services at 651/282-2274.

Sampling

- Follow normal aggregate sampling procedures in the Mn/DOT Grading and Base Manual. For a copy of the manual, contact MnDOT Map and Manual Sales at 651/296-2216.
- When shipping and storing whole bottles at gravel pits, sample the glass within the glass pile before crushing and blending.
- When crushing and screening glass in a blender, sample the glass from the blender.
- Conduct one visual inspection estimate for debris for every 50 cubic yards of reclaimed glass and conduct a general examination of the entire reclaimed glass lot before collecting samples.
- Collect field samples on a random basis.
- If the glass is in “whole bottle” form (without any pre-processing), about 40 pounds should be collected per sample.
- If the glass has been pre-crushed and/or screened, only about 10 pounds is needed per sample because it will be more uniform.

Visual inspection and estimation

- Use an eight- to 10-inch visual test pan that is one to two inches deep.
- If you plan to use “whole bottles” directly as your feedstock, break the containers into smaller pieces (e.g., one-inch minus) so the sample will fit into the test pan.
- Place one to three pounds of reclaimed glass in the test pan and level the sample.
- Compare the amounts of debris in the test pan with the standard reference charts that follow. Remember to disregard the glass and compare only the unattached debris with the reference charts. Charts are used with permission of the Society for Sedimentary Geology.

Data

- It’s helpful to keep a log of visual inspection results. Write down the sample date, shipping date, destination, percentage of debris, type of glass, source of glass, description of glass, sample location, uniformity of batch, sample size, reduction procedures, and names of those collecting sample and conducting visual test. Keep the log on file for future reference.