Extended Producer Responsibility Cost-Benefit Study

Working Paper 2 Appendices

Appendix A. Methodology and Data Sources

Working Paper 2 of the Recycling Reinvented Extended Producer Responsibility Cost-Benefit Study models one possible design of an EPR system for PPP (as envisioned by Recycling Reinvented) in a single state (Minnesota), using state-specific data to project the potential impacts of a state-based EPR system.

To complete Working Paper 2, the Study Team collected and compiled available data and conducted a series of analyses designed to answer key questions about the current extent of consumer PPP recycling and develop projections about PPP recycling under a modeled EPR system.

The Study Team relied primarily on reported data from current recycling programs in Minnesota and the Statewide Waste Characterization Study completed in October 2013.[i] Projections about the potential performance and associated costs of residential recycling programs under a modeled EPR system in Minnesota are based on the actual performance and costs of programs already in place in the state, with adjustments and extrapolations for the changes that EPR could bring. In a few areas of the study, necessary data were not available from Minnesota and data from outside the state were used. To maximize consistency, 2011 was used as the base year for analysis, the most recent year for which comprehensive data were available. All quantity data are presented in 2011 tons, and cost data are presented in 2011 dollars.

The following sections describe the methodologies and data sources used in each of the key areas of the analysis. Sections are labeled to align with section numbering in Working Paper 2.

Section 1. Introduction and Overview

1.4 Definition and Estimation of Consumer Packaging and Printed Paper Supply

Available data on both recycling and disposed waste in Minnesota are categorized by material type but, as with most current methods of characterizing and quantifying solid waste in the U.S., they do not clearly distinguish between packaging/printed paper and materials of the same type that are not considered "consumer PPP" as defined in this study, such as plastic bags and film, some of which are packaging materials and some of which are trash bags, pallet wrap, agricultural film, and other non-packaging materials. Furthermore, some product or packaging types may either be considered consumer PPP or not depending on how and where they are generated – for example, a steel food can generated in the home is considered consumer packaging, but a steel food can generated in a restaurant kitchen is not.[ii]

[i] Burns & McDonnell, *2013 Statewide Waste Characterization Study – Final Report*, Prepared for the Minnesota Pollution Control Agency, October 2013.

[ii] Consumer PPP is considered to be any package or printed material that consumers take possession of, or is intended for an individual consumer's use, regardless of whether generated or discarded at home or away from home. In general, if an individual consumer does not touch it, it is not considered consumer PPP.

For this study, estimates have been prepared of the current supply of consumer PPP by sector, based on best available data. Because of the limitations associated with the data sources used, estimates have substantially higher degrees of uncertainty at the subcategory level than at the major material category levels of Paper, Plastic, Metal, and Glass. As a result, the estimated supply and recycling estimates presented in Working Paper 2 are reported more broadly by the major material categories for consumer PPP.

Total generation was determined for the four major material categories—Paper, Plastic, Metal, Glass—by summing data on disposed tons and recycled tons in each category. The 2011 SCORE Survey was the foundational resource used for these estimates. Recycled tons from this survey were reported by material type and by generating sector (i.e., Residential vs. Institutional/Commercial/Industrial, or "ICI") but disposed tons were reported without generating sector breakouts. To estimate disposed tons in each material type for the base year (2011), the Study Team applied the composition percentages from the 2013 Statewide Waste Characterization Study to the total disposed tons reported in 2011.

The methodologies for estimating recycled and disposed tons by generator and material type, and for estimating the portion of these tons assumed to be designated consumer PPP, are described below.

Recycled Tons

Recycling tons reported in the SCORE Survey are tracked and reported by county governments using a number of different methods, each with varying degrees of accuracy. The variation in measurement methods is acknowledged to lead to some errors and inconsistencies in reported data. However, to maintain the study goal of using state-specific data as the primary foundation for the analysis, the Study Team chose to rely on reported data as much as possible while correcting for abnormalities identified as having potentially significant impacts on model outcomes.

All tons reported in the SCORE Survey under the four relevant material categories (Paper, Plastic, Metal, Glass) were included in the generation estimates except for two scrap metal categories.[iii] In addition, the Study Team adjusted the reported tons in the "Aluminum" category, which were believed to include a significant amount of non-PPP material. The adjusted estimate was based on the difference between reported aluminum beverage container sales reported in the 2009 study of beverage container recycling in Minnesota, adjusted for the 2011 population, and estimated tons of aluminum beverage containers and foil disposed in the 2013 Statewide Waste Characterization Study.[iv]

Based on input from state officials and industry experts, the Study Team also recognized that reported tons in the "Container Glass" category likely included a substantial amount of non-container glass and non-glass contamination, resulting in an overestimation of the actual quantity of container glass collected and recycled. Because no reliable source data were available on the estimated total generation of container glass in Minnesota, the Study Team discounted the glass quantities marketed (shipped to beneficiaries for further sorting and cleaning) using elevated residue rate factors for this category to account for the assumed glass recycling overestimation due to non-glass materials included in the reported tons recycled from the SCORE Survey.

[iii] Tons reported in the SCORE Survey categories of "Commingled Aluminum/Tin/Steel" and "Other Metal Scrap" were not included in the recycling tons calculations.

[iv] Sales data from the MPCA, *Summary of the Beverage Container Stewardship Initiative for Minnesota and Wisconsin*, 2009, p.3.

While the overall tons reported in the SCORE Survey at the material category level were not changed for any categories except for Metal (due to the adjustment of the "Aluminum" category and the exclusion of scrap metal categories), adjustments were made to the distribution of reported tons in specific materials subcategories to reflect the average market basket of each of the four major material categories. This was done to more accurately account for the tons of materials reported in mixed material categories, such as "Mixed Paper" and "Mixed Plastic", reported in the 2011 SCORE Survey but not assigned to an appropriate subcategory.

Total estimated recycling tons were then attributed to Residential and ICI generating sector streams.

Residential recycling collection quantities were based on residential tons collected for recycling reported in the 2011 SCORE Survey, except for three counties that provided self-reported data and five counties where SCORE Survey data were identified as extremely abnormal compared to counties with similar geographic or demographic profiles. In the cases where abnormalities were identified, reported residential tons recycled were replaced with average tons per household from a group of comparable counties.[v] Within residential tons, all tons reported as recycled in the four major material categories—Paper, Plastic, Metal (excluding scrap metal categories) and Glass—were assumed to be designated PPP.[vi]

Estimated tons of ICI collected for recycling were assumed to equal to the difference between total tons reported in the SCORE Survey and residential and away-from-home tons estimated for each material category.

In addition, the Study Team collected estimated tons recycled through existing away-from-home programs operated by the Recycling Association of Minnesota. These tons were assumed to be included within the tons of recycling attributed to the ICI generating sector in the 2011 SCORE Survey.

Disposed Tons

To estimate disposed tons in each material type for the base year (2011), the Study Team applied the composition percentages from the 2013 Statewide Waste Characterization Study to the total disposed tons reported in the 2011 SCORE Survey (excluding tons in the category "Problem Materials Not Recycled").

Because the 2013 Statewide Waste Characterization Study did not break out composition or tonnage by generating sector, the Study Team also developed estimates for the portion and composition of disposed waste in the residential stream. To do this, the Study Team first developed an estimate of total tons of disposed waste in the residential stream using **49%** as the default percentage of total waste assumed to be residential. This assumption is based on Minnesota's 2000 Statewide Waste Characterization Study, the last time the state estimated the residential percent of disposed waste. This percentage was applied to the total disposed tons reported by each county in the 2011 SCORE Survey, with the exception of 12 counties, which had self-reported data on residential tons disposed or on the estimated residential portion of total tons.[vii]

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[v] Counties with self-reported residential tons recycled include McLeod, Mower, and Pine. Counties with reported residential tons recycled identified as abnormal and corrected include Cook, Dakota, Freeborn, Lac qui Parle, and Nobles.

[vi] An analysis conducted by the Study Team of the material composition of residential recycling in the City of Seattle, where the most extensive classification of recycling composition in terms of PPP in the United States has been conducted, suggests that 97 percent of materials in these four categories collected from residents for recycling would be considered designated consumer PPP materials under the definitions established for this analysis. Based on an analysis of data from Seattle Public Utilities, *2010 Residential Recycling Stream Composition Study Final Report*, Prepared by Cascadia Consulting Group, August 2011.

[vii] Counties with self-reported residential tons disposed include Chisago, Hubbard, Isanti, Kanabec, Le Sueur, Lincoln, Mille Lacs, Nicollett, Olmsted, Otter Tail, Pine, and Sibley.

In the absence of Minnesota-specific residential disposed waste composition data, the Study Team applied residential disposed waste composition percentages at the subcategory level within each major material category from the 2009 Wisconsin Statewide Waste Characterization Study to the estimated total residential tons disposed in Minnesota in 2011 to derive the estimated material composition and residential disposed tonnage of PPP categories of discards.[viii] Estimates of ICI tons disposed were assumed to equal the difference between total tons reported disposed and residential tons estimated for each material category.

Generated Tons

As noted above, total tons generated at the material category level were calculated by summing estimates of disposed tons and recycled tons in each category. Residential and ICI tons generated, and estimated tons at the material-specific level, were calculated by summing the recycled and disposed tons estimated using the methodologies described above.

Table A-1 presents estimated total generation of the four major material categories by material type and generating sector.

Table A-1. Estimated Total Generation of Paper/Plastic/Metal/Glass in Minnesota, 2011

Material	*Residential Tons (Disposed + Recycled)*	*ICI Tons (Disposed + Recycled)*	Total Tons (Disposed + Recycled)
Paper	*589,000*	*1,100,000*	**1,689,000**
Corrugated Cardboard and Kraft Bags	*87,000*	*421,000*	**508,000**
Newsprint (ONP)	*176,000*	*39,000*	**215,000**
Magazines/Catalogs	*36,000*	*14,000*	**50,000**
Mixed Recyclable Paper*	*148,000*	*406,000*	**554,000**
Compostable Paper	*109,000*	*184,000*	**293,000**
Other Paper**	*33,000*	*37,000*	**70,000**
Plastic	*226,000*	*382,000*	**608,000**
PET Packaging	*27,000*	*42,000*	**69,000**
HDPE Packaging	*18,000*	*35,000*	**53,000**
Mixed Plastic Packaging	*34,000*	*24,000*	**58,000**
Bags and Film Plastic	*72,000*	*137,000*	**209,000**
Other Plastic	*75,000*	*145,000*	**220,000**
Metal	*45,000*	*48,000*	**93,000**
Aluminum Beverage Containers	*12,000*	*18,000*	**30,000**
Steel/Tin Containers	*33,000*	*30,000*	**63,000**
Glass	*113,000*	*88,000*	**200,000**
Glass Containers	*106,000*	*51,000*	**158,000**
Other Glass	*6,000*	*36,000*	**43,000**
Total	*972,000*	*1,619,000*	**2,590,000**

Note: Figures may not sum to total due to rounding.

**Mixed Recyclable Paper includes office paper, boxboard, gable top and aseptic cartons, phone books, and low-grade paper.*
***Other Paper includes polycoated packaging, cups, and other food service packaging.*

[viii] Wisconsin was chosen because it shares similar demographics, population density and distribution, and economic conditions with Minnesota, and because its 2009 Waste Characterization Study provides detailed residential composition data according to material types that are similar to the material types used in the Minnesota 2013 Statewide Waste Characterization Study.

Designation of Consumer PPP
To project how much of the four major material categories would be designated as consumer PPP under the modeled EPR system, the Study Team developed designation percentages for each material type within the four major material categories, for both the residential waste stream and the ICI streams.

Table A-2 shows the designation percentages used. These assumed designation percentages were developed based on data from EPR programs in Canada and from recycling and waste composition studies in the United States with detailed information about material types within each stream.

Table A-2. Assumed Designation Percentages under Modeled EPR System

Material	**Designated PPP in Residential Stream** (Disposed + Recycled)	**Designated PPP in ICI Stream** (Disposed + Recycled)	**Targeted for Collection under Modeled EPR System** At Home	Away-from-Home
Paper	**77%**	**10%**		
Corrugated Cardboard and Kraft Bags	**100%**	**0%**	**Y**	**Y** *(kraft bags only)*
Newsprint (ONP)	**100%**	**100%**	**Y**	**Y**
Magazines/Catalogs	**100%**	**100%**	**Y**	**Y**
Mixed Recyclable Paper	**92%**	**3%**	**Y**	**Y**
Compostable Paper	**13%**	**20%**	**N**	**N**
Other Paper	**13%**	**20%**	**Y** *(polycoated paper cups and packaging only)*	**Y**
Plastic	**62%**	**14%**		
PET Packaging	**100%**	**100%**	**Y**	**Y**
HDPE Packaging	**100%**	**15%**	**Y**	**Y**
Mixed Plastic Packaging	**100%**	**5%**	**Y**	**Y**
Bags and Film Plastic	**85%**	**4%**	**N**	**Y** *(clean recyclable bags and film only; collected only at designated collection kiosks)*
Other Plastic	**0%**	**0%**	**N**	**N**
Metal	**100%**	**37%**		
Aluminum Beverage Containers	**100%**	**100%**	**Y**	**Y**
Steel/Tin Containers	**100%**	**0%**	**Y**	**Y**
Glass	**94%**	**59%**		
Glass Containers	**100%**	**100%**	**Y**	**Y**
Other Glass	**0%**	**0%**	**N**	**N**

The total supply of designated consumer PPP estimated for this study was calculated by applying these percentages to the estimated tons presented in **Table A-1**.

Section 2. Current Conditions under Existing Recycling Programs in Minnesota

2.4 Estimated Performance and Costs of Existing Residential Recycling Programs

Estimated Residential Recycling Program Performance and Residential Recycling Rates for Consumer PPP
To estimate the overall performance of residential recycling collection in Minnesota, the Study Team divided the reported tons of consumer PPP collected from residents by county in the 2011 SCORE Survey (including all tons in the Paper, Plastic, Metal, and Glass categories except for scrap metal) by the number of households in each county.[ix,x]

Tons reported as collected from residents for recycling in the 2011 SCORE Survey were assumed to represent incoming gross tons to MRFs, meaning that they include materials ultimately discarded during processing, either as residue at the MRF or at the point of end use.

To account for the difference between tons collected for recycling and tons of consumer PPP actually used in the manufacturing of new products, the Study Team applied material-specific residue rate factors, including separate factors for processing losses at the MRF and end user losses. Different processing loss estimates were used for single-stream collection and dual/multi-stream collection, applied to the estimated tons collected based on the percentage of households served by each collection method (data on the tons collected using each collection method were not available).

Single-stream processing losses were based on residue rates reported by the Waste Management Recycle America Twin Cities single stream MRF in 2006.[xi] These factors were applied to 61 percent of all material collected in each of the four major material categories (the estimated percent of households served by single-stream collection).

Dual/multi-stream processing loss estimates were assumed to be 2 percent across all material categories, based on anecdotal reporting from dual-stream MRFs operating in Minnesota. This factor was applied to 39 percent of material collected in each of the four major material categories.

End user loss estimates were drawn from the recent study conducted by DSM Environmental Services Inc. for the Vermont Agency of Natural Resources.[xii]

Table A-3 shows the residue rate factors applied, by material category, in this study.

[ix] As noted above, the Study Team corrected 2011 SCORE Survey data for 8 counties, including 3 with self-reported data and 5 with data identified as extremely abnormal compared to counties with similar geographic or demographic profiles.

[x] Households in the portion of Carlton County served by the Western Lake Superior Sanitation District (WLSSD) were allocated to St. Louis County to enable alignment of household counts with tons reported by WLSSD, which were also allocated to St. Louis County. Combined tons reported by Pope/Douglas Counties were allocated to each county based on population.

[xi] Tim Goodman & Associates, *Single-Stream and Dual-Stream Recycling: Comparative Impacts of Commingled Recyclables Processing*, Prepared for the Minnesota Pollution Control Agency, 2006, p.12.

[xii] DSM Environmental, Systems Analysis of the Impact of Act 148 on Solid Waste Management in Vermont, October 2013, Table 40.

Table A-3. Residue Rate Factors Used

	Single Stream Processing Loss %	Dual Stream Processing Loss %	End User Loss %
Paper	1.7%	2.0%	2.0%
Plastic	4.2%	2.0%	7.0%
Metal	4.2%	2.0%	4.0%
Glass	15.2%	2.0%	11.0%

Estimated Residential Recycling Program Costs

There is no comprehensive statewide information about the specific costs of providing residential recycling service or the sources of financing for these services. The SCORE Survey collects information about expenditures and revenues of county governments across a range of recycling and waste reduction related activities including recycling of both non-PPP and PPP materials. The category used for reporting recycling expenditures is generally used to include only county government spending for recycling-related services across residential and ICI sectors. Although some county governments provide residential recycling service for or all of their residents, most residential recycling programs are provided by municipalities, and county governments only contribute a portion of funds used for these programs. Most counties do not collect information about total program costs or spending from municipalities in their jurisdiction.

Furthermore, because many households in Minnesota receive service through private subscriptions, even municipal governments in many areas are uncertain about the costs, financing, and spending levels associated with residential recycling service.

To assess residential recycling program costs, then, the Study Team relied on data from a sample of municipal and county-contracted residential recycling programs that do collect and report on the costs and outcomes of their programs.

Estimated average residential recycling collection costs per household were calculated separately in this study for Urban areas, Suburban areas, and Rural areas (classified using USDA Rural-Urban Continuum codes - see **Appendix B** for a complete list of county classifications), using two separate data sources.

For **Urban** areas, estimated costs for this analysis are based on reported contract costs from a municipal dataset compiled for the six counties in the Twin Cities metro area that are members of the Solid Waste Management Coordinating Board (SWMCB). Exhaustive program data from municipalities in these counties are collected using a customized Re-TRAC database. The Study Team compiled 2011 data from 82 municipally contracted residential recycling collection programs in this database, including 78 programs with reported contract costs. See **Table C-1** in **Appendix C** for a list of all municipal programs included in this analysis.

Estimated collection costs reported in the study are weighted averages of reported contract costs divided across the number of households served under contract through these programs.

More limited data are available for residential recycling program costs in **Suburban** and **Rural** areas. To estimate average costs for programs in these areas, the Study Team used reported recycling expenditures and residential recycling tons collected in the 2011 SCORE Survey by county governments that act as the sole recycling service providers for residents in their jurisdiction, either with county-provided direct collection or drop-off recycling service. Of Minnesota's 87 counties, the Study Team identified 25 counties in this category, with 18 counties providing direct collection to some or all households and 7 counties providing drop-off recycling only.[xiii] **Table A-4** lists all counties included in this analysis.

Table A-4. Counties as Sole Providers of Residential Recycling

County Service Provided	Suburban		Rural	
Direct Collection	Brown Koochiching McLeod Mower Pipestone	Rice Steele Watonwan Winona	Big Stone Chippewa Cottonwood Jackson Lincoln	Lyon Renville Stevens Swift
Drop-Off Recycling	Pine		Cass Clearwater Grant	Norman Roseau Wadena

Estimated annual per household service costs presented in the study are weighted averages, the sum of total reported recycling expenditures by sample programs divided across the total number of households served through these programs. Averages for county-provided direct collection and drop-off recycling programs were calculated separately but due to the small sample size, data from Suburban and Rural counties were grouped together so the estimates do not account for differences between programs in these two areas.

It should be noted that all cost data represent government-contracted or directly provided services. As was mentioned previously, a substantial portion of Minnesota's households individually subscribe for waste and recycling collection service. Other studies have demonstrated that service costs are lower, on average, in communities with contracted service.[xiv] This study assumes that all PPP recycling services under the modeled EPR system would be contracted, since they would be paid by producers.

Estimated annual per household spending on P&E under existing programs was calculated using the same methodology and data sources as for estimated collection costs, described above, although with a smaller sample size for municipal programs in Urban areas: only 58 of the 82 programs in the sample reported P&E spending in 2011.

The Study Team used these weighted average per household cost estimates to develop an estimated range of residential PPP recycling program costs statewide under the current system, assuming that per household costs and P&E spending under subscription service were similar to contract service, and that these costs were only applicable to subscriber households. Because of the uncertainty associated with these cost estimates, the Study Team estimated a range of +/- 10% of the calculated total based on the weighted average per household costs.

[xiii] Four additional counties (Cook, Freeborn, Lac qui Parle, and Nobles) were identified as the sole providers of residential recycling services but did not have reliable residential recycling tons reported and were therefore not included in the analysis.

[xiv] Minnesota Pollution Control Agency, Analysis of Waste Collection Service Arrangements, Prepared by Foth, June 2009.

The range was derived by applying the weighted average per household service costs and P&E spending to the estimated number of households served (under contract and subscription-based direct collection and via drop-off only) in each area (Urban/Suburban/Rural), plus or minus ten percent.

Table A-5 shows how weighted average costs were applied to household counts to develop the estimated cost range of the current system.

Table A-5. Basis for Estimated Cost Range under Current System

	Direct Collection Service			No Direct Collection				
	HHs with Direct Collection	Annual Per HH Service Costs		Non-Subscriber HHs		HHs with Drop-Off Recycling	Annual Per HH Service Costs	
		Collection	*P&E*				*Collection*	*P&E*
Urban	1,213,500	$36.15 +/- 10%	$0.47 +/- 10%	131,100	*no service costs assumed*	251,800	$29.89 +/- 10%	$0.12 +/- 10%
Suburban	163,500	$33.26 +/- 10%	$0.99 +/- 10%	13,300		149,700	$29.89 +/- 10%	$0.12 +/- 10%
Rural	68,600	$33.26 +/- 10%	$0.99 +/- 10%	7,800		101,900	$29.89 +/- 10%	$0.12 +/- 10%
Statewide	**1,445,600**			**152,200**		**503,400**		

Current Methods of Program Financing and Charges to Residents
Estimated annual per household charges were calculated following the same methodology and data sources as for estimated collection costs for municipal programs for which data were available. Of the 82 municipal programs in the sample, 61 reported per household charges.

Section 3. Projected Conditions under Modeled EPR System in Minnesota

3.3 Projected Performance and Costs of Residential Recycling Programs

To project the estimated performance and costs of residential recycling programs under the modeled EPR system, the Study Team analyzed the performance and costs of a subset of the municipal and county program data compiled and analyzed as described under the discussion of Section 2.4, above. All programs included in the analysis provide residential recycling collection using the standardized set of collection practices identified for inclusion under the modeled EPR system, including:

- Cart-based single-stream collection for single-family households and on-site single-stream collection for multifamily households;
- Drop-off service for households without direct collection service, with drop-off sites conveniently located and serving an average of 1,000 households per location;
- Collection of a standardized set of materials covering the vast majority of packaging and printed paper generated in the residential stream.

Of the 82 municipalities from the SWMCB Re-TRAC database with contracted service and reported contract costs, 26 programs were included in the analysis. These programs provided contracted recycling service to all residents in their jurisdiction, including all multifamily households. See **Table C-1** in **Appendix C** for a list of all programs included in this analysis. In addition, one countywide program (in Winona County) serving 31 municipalities with universal direct collection service was included, and one countywide program (in Crow Wing County) providing drop-off recycling to residents were included.

Projected Average Residential Program Performance and Costs

As in the analysis of the current program performance and costs, weighted averages for these programs were calculated by dividing the total tons reported collected and total collections costs across the number of households served through these programs. Data from programs providing direct collection in both Urban and Suburban areas were analyzed together. Projections related to the performance and costs of providing drop-off recycling service are based solely on the data available from one Suburban county.

No programs in Rural areas were identified as having the attributes of programs to be provided under the modeled system, so no Rural area programs were included in the analysis. However, in the 2011 SCORE Survey, Rural counties reported collecting approximately the same average tons per household as Suburban counties, and the Study Team felt that it would be reasonable to assume that Suburban and Rural areas receiving the same services would likewise perform similarly under the modeled system. In addition, Rural households make up only 8 percent of the population in Minnesota and, under the modeled system, fewer than half of them would receive curbside collection, so the Study Team felt that potential differences in service costs between Suburban and Rural areas would not have a significant impact on the overall projected costs of the modeled system.

The weighted averages calculated for these programs are reported in **Table 14** in Working Paper 2, and were used as the basis for the baseline projections for residential recycling collection and for the projections of annual service costs on a per-household basis, shown in **Table A-6** below (corresponds to **Table 15** in Working Paper 2).

Table A-6. Assumed Average Program Performance and Costs under Modeled EPR System

	Annual Tons/HH Collected for Recycling		Annual $/HH Service Costs	Annual $/HH P&E Spending
	Baseline	+10% P&E Multiplier		
Direct Collection	0.250	0.275	$35.17	$2.00
Drop-off Recycling	0.135	0.149	$15.66	$2.00

The Study Team assumed that the modeled EPR system would spend $1 per household per year for standard promotion and education (P&E) activities, including information (which may be provided by local governments in coordinated communications) regarding collection day schedules and drop-off collection site locations and service hours. This base level of P&E spending is the minimum amount recommended by multiple studies as the minimum amount needed to leverage the full potential of residential recycling programs, and that this amount would support the baseline level of collection projected.[xv]

The Study Team assumed that the modeled EPR system would include an additional $1 per household in annual spending to support a statewide multimedia communications and outreach campaign promoting

[xv] KPMG, Blue Box Program Enhancement and Best Practices Assessment Project, July 2007, p.58.

recycling at home, away from home, and through return to retail plastic bag and film collection. The Study Team assumed that this campaign, using social marketing best practices shown to be effective in increasing recycling motivation and participation, would result in in an additional 10 percent increase in tons per household collected over the projected baseline.

The assumption of a 10 percent multiplier potential effect was developed based on outcomes reported by an evaluation of a pilot campaign implemented in three jurisdictions in Minnesota—St. Louis County, McLeod County and the Western Lake Superior Sanitary District, which represents Duluth— in 2008-09. The campaign, which was implemented in an area covering 107,500 households, cost approximately $85,000, or around $0.80/household. The participating jurisdictions reported an average increase of 13 percent in residential recycling tonnage collected in the three months following the campaign launch, compared to the same period in prior years.[xvi] However, subsequent evaluation showed that recycling tonnage dropped back to pre-campaign levels the following year, suggesting that sustained annual investments would be required to maintain recycling participation among households, which has been included as an annual cost in this study, and that long-term effects might be lower than projected based in this short-term campaign.[xvii]

Projected Total Statewide Residential Program Performance and Costs

To project the total number of tons would be collected through residential programs under the modeled system, the Study Team applied the average number of tons collected per household under the two service conditions to the total number of Minnesota households projected to receive each type of service under the modeled EPR system. Total program costs were projected in the same way, applying the average cost per household under the two service conditions to the number of Minnesota households receiving each type of service.

Table A-7 presents the figures used as the basis for projected residential tons collected and estimated system costs under the modeled EPR system.

Table A-7. Basis for Projected Residential Recycling Program Performance and Costs

	Direct Collection Service				No Direct Collection			
	HHs with Direct Collection	Average Tons/HH *Collected for Recycling*	Average $/HH *Collection*	Average $/HH *P&E*	HHs with Drop-Off Recycling	Average Tons/HH *Collected for Recycling*	Average $/HH *Collection*	Average $/HH *P&E*
Urban	1,540,700 *(96%)*	0.275	$35.17	$2.00	55,700 *(4%)*	0.149	$15.66	$2.00
Suburban	209,100 *(64%)*	0.275	$35.17	$2.00	117,400 *(36%)*	0.149	$15.66	$2.00
Rural	83,300 *(46%)*	0.275	$35.17	$2.00	95,100 *(54%)*	0.149	$15.66	$2.00
Statewide	**1,833,200** *(87%)*				**268,100** *(13%)*			

[xvi] Curbside Value Partnership, *Increasing Recycling Through Enhanced Education and Measurement*, Green Prosperity Conference Presentation, November 4, 2009.

[xvii] Wayne Gjerde, Minnesota Pollution Control Agency. Personal communication, December 3, 2013.

Additional residential tons projected to be collected under the modeled system were assumed to be distributed across material categories based on an average market basket of materials from a single-stream residential MRF,[xviii] assuming the following distribution of materials:

- Paper – 70.5%
- Plastic – 9.8%
- Metal – 5.0%
- Glass – 14.8%

To estimate the total tons of consumer PPP recycled, the Study Team adjusted down the estimated tons collected to account for material losses by applying the single-stream residue rate factors from **Table A-3** to all projected residential tons collected.

3.4 Away-from-Home Recycling Programs under Modeled EPR System

Projected Performance and Costs of the Modeled Public Space Recycling Program

Projected tons collected through public space recycling bins were based on tonnage factors from other public space recycling programs that the Study Team is familiar with. Based on these other study collection values, it was assumed that each bin would collect 1.5 tons per year of heavily contaminated recyclables, and that 0.4 tons (27%) of contamination would be removed, resulting in 1.1 tons per bin of recyclables that would be marketed. The program design modeled for these bins is that they would collect all materials accepted in the residential collection program; however, the composition collected in the bins would be vary based on the specific location in which they are situated. For example, bins in parks were assumed to collect primarily beverage containers; bins in schools were assumed to collect lunch milk containers, and bins at transit stops would have higher quantities of printed paper.

To project the corresponding costs to support this program, the Study Team assumed that only costs associated with the purchase and maintenance/replacement of recycling bins, the collection of recyclables from consolidation points (assuming one consolidation point for every twelve bins, on average), and the transfer and processing of collected materials were included. The Study Team assumed that there would be little or no additional cost to collect from recycling bins as long as they are paired with an existing trash bin, and that these costs would continue to be paid for by local authorities.

Collection of public spaces recyclables from consolidation points was modeled based on assuming a front-load truck would collect recyclables from front-load bulk containers on a dedicated public spaces route. Routing software and typical cost and productivity factors were used to calculate the time and cost that it would take for a route truck to service the front-load containers. Because the composition of materials in public space bins was modeled to accept mixed paper and containers, consolidated public space recyclables could be collected by the same route trucks used for multifamily recyclables at a lesser cost than modeled with the dedicated route methodology used for this study. Finally, because of the mixed nature of the collected public spaces recyclables, the Study Team assumed that they would be delivered to the same residential MRFs and transfer stations used for residential materials and transferred/processed for the same general cost. Due to the high contamination levels typically found in public spaces recycling programs, MRFs were assumed to charge a contamination surcharge for the material.

[xviii] The average market basket estimate used for this study is based on a proprietary residential recycling composition study performed by members of the Study Team for a single-stream MRF in Washington State in 2013.

Projected Performance and Costs of the Modeled Plastic Bag and Film Collection Program
To project the tons of consumer PPP that could be captured through the retail-based collection of plastic bags and film, the Study Team assumed that at least 70 percent of the state's 933 grocery stores and a number of other retail locations would serve as collection sites, ensuring that 95 percent of Minnesota households would have access to at least one collection location within 10 miles of their home - this collection access assumption is minimally higher than the current estimate of collection access (based on national statistics).[xix] Similarly, national statistics suggest that approximately 500 tons per year of residential film, primarily retail carry-out sacks, would be collected in a state with Minnesota's population. The Study Team projected that residential film returned to retail for collection would rise to approximately 2,000 tons of plastic bags and film, based on an aggressive promotion and education program, with an emphasis to collect other types of clean and dry residential polyethylene film such as cereal box liners and bread bags.

The primary costs of supporting retail-based collection of plastic bags and film is assumed to be promotion and education related to the program, and the cost of this for the modeled EPR system is assumed to be incorporated into the projected $1/household cost to support a statewide communications campaign. Retail film collection programs generally have a near zero net cost assuming that collection sites have free backhaul of collected film from retail stores to central warehouse and distribution centers, which is the case for most existing retail collection points.

3.5 Recycling Processing Infrastructure and Material Flow under Modeled EPR System

The Study Team created a transfer and processing system model for Minnesota for use in analyzing potential cost reductions that could be realized under a producer-financed processing system. The model was developed with two objectives in mind: (1) to provide planning-level cost estimates of suitable precision for evaluating whether alternative scenarios have significant differences in cost; (2) to use general calculated cost factors, rather than specific Minnesota MRF market price data, so that it can be used to model costs in states other than Minnesota as well.

The model accepts the following inputs:

- Tons of consumer PPP collected in each county (88 inputs for each of Minnesota's counties and the Western Lake Superior Sanitary District);
- Geographic coordinates for a prospective or existing recyclables transfer station in each county;
- Geographic coordinates for existing or prospective regional MRFs that recyclables could be direct-delivered or transferred to;
- Hourly processing capacities for existing single-stream MRFs, including and the ability to evaluate expansion scenarios for existing facilities;
- Ability to designate tonnage flows (including split flows) under a managed MRF processing system.

[xix] "Plastic Film and Bag Recycling Collection: National Reach Study," Moore Recycling Associates Inc., April 2012 reports that 91 percent to 93 percent of the U.S. population has access to plastic bag drop-off points within ten miles from their home and 72 percent to 74 percent also have access to film drop-offs for other types of clean and dry household polyethylene film.

Model outputs include:

- Whether it is less costly in each specific county for route trucks to direct-deliver their collected load of consumer PPP to the nearest large regional MRF or whether the system cost would be reduced by consolidating and shipping the recyclables by transfer trailer;
- Processing cost per ton at each existing or prospective MRF (modeled) based on tons per hour MRF capacity and extent to which that capacity is utilized for two shifts per day processing; and
- Total statewide post-collection delivery and processing cost.

Following is a list of cost and productivity assumptions embedded in the model, including a brief discussion of the source or basis of the assumption.

- As a baseline, the default location for route trucks to deliver collected tonnages in each county is assumed to be the center point of the four longitude and latitude lines that bound the limits of each county. The effect of this generalization is assumed to average out over Minnesota's 87 counties and is believed to be of suitable precision for this study. Options for more refined estimates would include substituting population centroids, geographic centroids, route truck travel time centroids, or specific locations of an existing waste transfer location or small recycling location in each county. For the purposes of the Minnesota analysis, the Study Team adjusted two of the modeled transfer site locations from default center points – moving the Beltrami County center point slightly south so that it would not be in the center of a lake, and moving the St. Louis County point from the center point to the coordinates for Duluth. St. Louis County is the largest county by total area in Minnesota; however, the vast majority of its population is in Duluth, which is in the extreme southeastern corner of the county.
- Distances between two map points were first calculated as the shortest directional distance between the two points, and then increased by 25 percent to provide an estimate of indirect road miles that would be traveled to drive between any two points. This 25 percent factor was developed by averaging the results of 18 different combinations of Minnesota counties and MRFs using internet-based driving directions software, with the goal of least travel time between locations. The average driving speed was set at 55 miles per hour.
- Collection route truck costs and transfer truck and trailer capital and operating costs (including capital financing costs, fuel, maintenance, and operator salary costs) were assumed to be $100 per hour.
- Transfer costs were modeled based on trucking 20 tons of recyclables from transfer station to MRF. The transfer costs are composed of three factors:
    - Transfer station annualized construction costs and operations costs. These costs vary depending on the size of the transfer station – as the size of transfer stations increase, the cost per ton decreases, approaching a lower limit. Two formulae[xx] were used to calculate transfer station costs:

[xx] These formulae follow from a similar recyclables transfer and processing optimization study that a Reclay StewardEdge consulting team developed for residential PPP managed under Ontario's EPR system in 2012 ("A Study of the Optimization of the Blue Box Material Processing System in Ontario," June 2012). That analysis had extensive input by transfer station operators into the assumptions made by the study. The original formulae developed for this study had inputs of metric tonnes, which have been converted to short tons for this analysis. The 12 month currency exchange rate between the U.S. and Canadian dollars was 1.0004 in 2012 (http://www.bankofcanada.ca/rates/exchange/exchange-rates-in-pdf/) – because the two currencies were on par, modeled costs are recent, and inflation rates have been very low, no additional adjustments to the financial figures of the two formulae have been made. It should be noted that a single cost point for small transfer

        - Transfer stations handling 11,000 tons per year or less were modeled as having costs per this formula: cost/ton = 32.23 - 0.000646*(annual tons).
        - Transfer stations handling over 11,000 tons per year were modeled as having costs per this formula: 1188.8*(annual tons/1.102)^(-0.416).
    - Transportation costs associated with transferring loads of recyclables between two points, including annualized truck and trailer capital costs, fuel/maintenance costs, and personnel costs. These costs are directly proportional to the round trip road time between those two points. The following formula is used to describe the dollars per ton round trip cost used in the model: (one-way directional distance)*(1.25 road distance factor)*(2 round trip factor)*0.090909; and
    - Time-based costs associated with weighing in/out and unloading of transferred loads at the destination MRF, which was assumed to take 30 minutes per load, or $2.50 per ton.
- Direct delivery costs associated with route trucks delivering collected recyclables to a point other than a small recycling center or small transfer station modeled in the center point of a county (e.g., to a specific large MRF or to a large and efficient transfer station in an adjoining county) were modeled as the distance from the center point of each county to the nearest regional MRF or next closest county center point (for evaluating potential efficiencies of combined large transfer stations verses smaller but more numerous transfer stations).
- For this analysis, it was assumed that collection route trucks collect on average 3 tons of consumer PPP before traveling to unload (note that the maximum quantity of recyclables able to be collected by route trucks is 7 tons of residential PPP, although this quantity can only be collected by fast moving fully-automated compaction trucks collecting cart-contained recyclables on dense urban/suburban routes). Although hourly truck costs and speed/road distance factors are the same as for transfer scenario calculations, the lesser recyclables quantity results in this formula for direct delivery transportation cost per ton: (one-way directional distance)*(1.25 road distance factor)*(2 round trip factor)*0.60606. Because the route trucks need to unload regardless of whether they are direct delivering to a remote facility or a central county facility, there is no factor in this equation for off-loading time and expense because that cost is a necessary part of all scenarios and will not vary depending on option analyzed.
- MRF processing costs included in the model assume that all recyclables will be collected single stream. Large MRFs operated at their hourly capacity for two shifts per day have a much lower cost per ton processing efficiency compared to small MRFs or to MRFs that are not operated for a full two shifts per day. Like the transfer cost formulae, the model developed for this study relied on modeled processing costs from the Ontario optimization study as the comparative basis between different MRF sizes and utilizations. See Table 19 in Working Paper 2 for the assumed processing costs used.

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stations of 2,500 metric tonnes was modeled in the study, but a cost curve for medium-to-large transfer stations over 10,000 metric tonnes (11,000 short tons) was developed. For the purposes of this project, we have assumed a linear relationship between costs and tons exists over the tonnage range from 0 to 11,000 for small transfer stations (passing through the 2,500 metric tonne data point). Assumptions for small transfer stations include compacting 10 tons of recyclables into a compactor shell using roll-off type waste compactor equipment at a compaction ratio not to exceed 2:1, and tandem transfer of two shells (total of 20 tons of recyclables) to a regional MRF. Assumptions for medium/large transfer stations include loading recyclables under compaction into a single large transfer trailer, again producing a payload of 20 tons of recyclables under a 2:1 compaction ratio.

The Study Team first used the transfer and processing model to evaluate whether system costs would be lower using consolidated regional transfer stations and having route trucks travel further distances, or using smaller and more numerous transfer stations with route trucks traveling shorter distances. Because of the relatively small tonnages in each route truck (three tons when collection is complete, on average), the Study Team found that it was virtually never the case that the system cost would be reduced by consolidating transfer station locations from each county into regional transfer stations. Only in the case where a regional MRF was in the same county, or in some cases in a nearby adjoining county, was the cost of direct delivery justified because the cost of transfer could be avoided. The result of this analysis confirmed that it is generally worthwhile for each county to have either a MRF or a recyclables transfer station within its limits in order to minimize system costs.

Once this result was identified, three scenarios were tested in the model under the additional tonnages projected to be collected under EPR:

Baseline. The baseline scenario was modeled by applying the processing and transfer cost estimates to existing material flow arrangements, but with the higher consumer PPP recovery quantities projected to be collected under the modeled EPR system. These existing flow relationships were estimated from annual data on quantities and destinations of transferred and marketed recyclables that MRFs report to the Minnesota Pollution Control Agency as part of their annual permit renewals. This scenario assumes that a significant quantity of collected PPP is still processed at small local MRFs where sorting is primarily manual, with an estimated average cost of $163 per ton.

Optimized transfer and processing at existing regional MRFs. A second scenario was modeled so that all collected tons would either be direct delivered or transferred to one of nine existing larger regional single stream MRFs so that the system cost was minimized. Under this approach, the utilization of these existing regional MRFs would increase to 87 percent of target processing rates (based on full two shifts per day, five days per week), and resulting in significantly more efficient processing, even though transportation costs increase over the baseline scenario.

Optimized transfer and processing at optimally located regional MRFs. The third scenario modeled included the construction of new single-stream MRFs in regions of the state where sufficient population and tonnage of PPP collected exist to support cost-effective MRF operations, with savings on transfer cost from traveling further distances to existing MRFs (currently clustered around the Twin Cities metro area) offsetting the cost of new MRF construction and operation. The modeled scenario recommended the construction of two new 20 ton per hour single-stream MRFs, one in Crow Wing County to serve as a processing location for northern counties, and a second MRF in Rochester. These two facilities would replace MRF capacity in the Twin Cities metro area, maintaining a processing system with the same capacity utilization as modeled under the second scenario (87 percent of target processing rates based on full two shifts per day, five days per week).[xxi]

[xxi] Note that this scenario was not conducted as a complete greenfield analysis where a general theoretical optimal number, size, and locations of MRFs would be calculated. Instead it was conducted as a more specific analysis of the invested capital in the existing system of MRFs, and where long-term savings could be realized by thoughtfully locating new facilities and repurposing existing consumer PPP capacity to processing ICI recyclable material or other uses so that total system costs could be reduced.

Appendix B. USDA Rural-Urban Continuum Classification of Minnesota Counties

For this study, Minnesota counties were classified into three groups, using the Rural-Urban Continuum (RUC) codes established by the USDA.[xxii] Counties with RUC codes 1-3 were classified as "Urban"; counties with RUC codes 4-6 were classified as "Suburban"; counties with RUC codes 7-9 were classified as "Rural." The USDA defines nine RUC codes, as follows:

USDA RUC	USDA RUC Description
1	Metro - Counties in metro areas of 1 million population or more
2	Metro - Counties in metro areas of 250,000 to 1 million population
3	Metro - Counties in metro areas of fewer than 250,000 population
4	Nonmetro - Urban population of 20,000 or more, adjacent to a metro area
5	Nonmetro - Urban population of 20,000 or more, not adjacent to a metro area
6	Nonmetro - Urban population of 2,500 to 19,999, adjacent to a metro area
7	Nonmetro - Urban population of 2,500 to 19,999, not adjacent to a metro area
8	Nonmetro - Completely rural or less than 2,500 urban population, adjacent to a metro area
9	Nonmetro - Completely rural or less than 2,500 urban population, not adjacent to a metro area

The following table lists all Minnesota Counties classified into the three groups used for this study.

Table B-1. Classification of Minnesota Counties by USDA 2013 RUC Codes

Urban			
County	2011 Population	2011 Households	USDA RUC Code
Anoka	334,053	122,151	1
Benton	38,558	15,155	3
Blue Earth	64,383	24,634	3
Carlton	35,492	13,586	2
Carver	92,104	33,202	1
Chisago	53,929	19,537	1
Clay	59,644	22,516	3
Dakota	401,221	153,098	1
Dodge	20,243	7,528	3
Fillmore	20,868	8,580	3
Hennepin	1,163,060	480,754	1
Houston	18,933	7,860	3
Isanti	38,209	14,128	1
Le Sueur	27,655	10,772	1
Mille Lacs	26,003	10,155	1
Nicollet	32,949	12,318	3
Olmsted	145,379	57,595	3
Polk	31,489	12,708	3
Ramsey	510,810	203,818	1
Scott	131,556	45,656	1
Sherburne	88,954	30,439	1
Sibley	15,193	6,039	1
St. Louis	200,143	84,993	2
Stearns	150,996	56,514	3
Wabasha	21,589	8,827	3
Washington	240,640	88,921	1

[xxii] For more information about USDA Rural-Urban Continuum codes, see http://www.ers.usda.gov/data-products/rural-urban-continuum-codes.aspx#.UYJuVEpZRvY

Wright	126,033	44,955	1

Suburban			
County	2011 Population	2011 Households	USDA RUC
Becker	32,770	13,372	6
Brown	25,756	10,781	6
Crow Wing	62,745	26,193	4
Douglas	36,240	15,498	6
Faribault	14,506	6,246	6
Goodhue	46,168	18,803	4
Itasca	45,034	18,847	6
Kanabec	16,170	6,419	6
Kandiyohi	42,118	16,769	4
Koochiching	13,221	5,859	6
Lake	10,822	4,831	6
McLeod	36,489	14,628	6
Meeker	23,242	9,181	6
Morrison	33,212	13,142	6
Mower	39,281	15,891	4
Otter Tail	57,243	24,125	6
Pennington	14,018	5,879	6
Pine	29,647	11,369	6
Pipestone	9,525	4,038	6
Rice	64,717	22,423	4
Rock	9,644	3,915	6
Steele	36,530	14,343	5
Todd	24,823	9,777	6
Waseca	19,166	7,326	6
Watonwan	11,197	4,525	6
Wilkin	6,584	2,708	6
Winona	51,386	19,609	4

Rural			
County	2011 Population	2011 Households	USDA RUC
Aitkin	16,202	7,330	8
Beltrami	45,212	17,163	7
Big Stone	5,240	2,285	9
Cass	28,396	11,926	9
Chippewa	12,332	5,214	7
Clearwater	8,774	3,561	8
Cook	5,216	2,521	9
Cottonwood	11,682	4,860	7
Freeborn	31,160	13,195	7
Grant	5,993	2,608	9
Hubbard	20,439	8,714	7
Jackson	10,203	4,422	7
Kittson	4,528	1,984	9
Lac qui Parle	7,195	3,145	9
Lake of the Woods	4,011	1,777	9
Lincoln	5,819	2,552	9
Lyon	25,951	10,265	7
Mahnomen	5,441	2,031	8
Marshall	9,473	4,000	8
Martin	20,716	9,017	7
Murray	8,640	3,701	9
Nobles	21,365	7,970	7
Norman	6,859	2,872	8
Pope	10,896	4,721	8
Red Lake	4,105	1,747	8
Redwood	15,986	6,579	7
Renville	15,540	6,516	8
Roseau	15,536	6,301	7
Stevens	9,749	3,724	7
Swift	9,677	4,216	7
Traverse	3,530	1,519	9
Wadena	13,709	5,663	7
Yellow Medicine	10,331	4,260	9

Appendix C. Municipalities Included in Municipal Program Analysis

Table C-1. Municipalities Included in Municipal Program Analysis

Counties	Municipalities			
	Included in Current Average Program Analysis	*collection cost reported*	*P&E spending reported*	Included in Best Practices Program Analysis
Anoka	Anoka	✓	✓	
	Blaine	✓		
	Centerville	✓	✓	✓
	Circle Pines	✓	✓	
	Columbia Heights	✓	✓	
	Fridley		✓	
	Ham Lake	✓	✓	
	Hilltop	✓	✓	
	Ramsey	✓	✓	
	Spring Lake Park	✓	✓	✓
Dakota	Farmington			✓
	Hastings			
Hennepin	Brooklyn Park	✓	✓	✓
	Champlin	✓		
	Corcoran	✓		
	Dayton	✓	✓	
	Deephaven	✓	✓	✓
	Edina	✓	✓	
	Excelsior	✓		
	Golden Valley	✓	✓	
	Greenfield	✓		✓
	Greenwood	✓		✓
	Hanover	✓		
	Hassan	✓		
	Hennepin Recycling Group (Brooklyn Center, Crystal, New Hope)	✓	✓	
	Hopkins	✓	✓	
	Independence	✓	✓	
	Long Lake	✓		
	Loretto	✓	✓	
	Maple Grove	✓		✓
	Maple Plain	✓		
	Medicine Lake	✓		✓
	Medina	✓	✓	
	Minneapolis	✓	✓	
	Minnetonka	✓	✓	
	Minnetonka Beach	✓		✓
	Minnetrista	✓	✓	✓
	Mound	✓	✓	
	Orono	✓		
	Osseo	✓	✓	
	Plymouth	✓	✓	
	Robbinsdale	✓	✓	

Counties	Municipalities			
	Included in Current Average Program Analysis	*collection cost reported*	*P&E spending reported*	Included in Best Practices Program Analysis
	Rockford	✓	✓	
	Rogers	✓		
	Shorewood	✓	✓	✓
	Spring Park	✓		
	St. Bonifacius	✓	✓	
	St. Louis Park	✓	✓	
	Tonka Bay	✓		✓
	Wayzata	✓		
	Woodland	✓		✓
Ramsey	Arden Hills	✓	✓	
	Falcon Heights	✓	✓	✓
	Gem Lake	✓		
	Lauderdale	✓	✓	
	Little Canada	✓	✓	
	Maplewood	✓	✓	
	New Brighton	✓	✓	
	North St. Paul	✓	✓	
	Roseville	✓	✓	
	Shoreview	✓	✓	
	St. Paul	✓	✓	
	Vadnais Heights	✓		✓
	White Bear Lake	✓	✓	
	White Bear Township	✓	✓	
Washington	Afton	✓	✓	✓
	Bayport		✓	
	Baytown Township	✓	✓	
	Birchwood	✓	✓	✓
	Dellwood	✓	✓	✓
	Forest Lake	✓	✓	
	Grant	✓		✓
	Grey Cloud Island Township	✓	✓	✓
	Lake St. Croix Beach	✓	✓	✓
	Lakeland	✓	✓	
	Lakeland Shores	✓	✓	
	Mahtomedi	✓	✓	
	Oak Park Heights	✓	✓	
	Scandia	✓	✓	
	Stillwater	✓	✓	
	West Lakeland Township	✓	✓	✓
	White Bear Lake	✓	✓	