

SOUTH DAKOTA DEPARTMENT OF
AGRICULTURE AND NATURAL
RESOURCES

STATE OF SOUTH DAKOTA RECYCLING/DIVERSION REPORT 2024

PROJECT NAME
PROJECT NO. 172671

REVISION 0
OCTOBER 2024

CONTENTS

EXECUTIVE SUMMARYI

1.0 Introduction 1-1

2.0 Methods and Materials 2-1

3.0 Results 3-3

 3.1 Recyclable Material Composition 3-3

 3.2 Contamination Rate 3-6

 3.3 Greenhouse Gas Emission Reduction Evaluation..... 3-6

4.0 Conclusion 4-9

APPENDIX A – STATE COMMODITIES REPORTING FORM

FIGURES

Figure 3-1 MSW Recycled by Material, 2011 3-4

Figure 3-2 MSW Recycled by Material, 2022 3-4

Figure 3-3 MSW Recycled by Material, 2023 3-5

TABLES

Table 2-1 Recycling Reporting Commodities 2-2

Table 3-1 Commodity Tonnages 3-3

Table 3-2 GHG Emissions Analysis 3-7

List of Abbreviations

Abbreviation	Term/Phrase/Name
DANR	South Dakota Department of Agriculture and Natural Resources
EPA	United States Environmental Protection Agency
Form	State Commodities Reporting Form 2024
GHG	Greenhouse Gas Emissions
MSW	Municipal Solid Waste
MTCO ₂ E	Metric Tons of Carbon Dioxide Equivalent
WARM	Waste Reduction Model

Executive Summary

The South Dakota Department of Agriculture and Natural Resources (DANR) engaged Burns & McDonnell Engineering Company, Inc. to conduct a recycling survey across nine recycling facilities in the state of South Dakota. The survey aimed to analyze the composition of recyclable materials, assess contamination rates, and compare the results with a previous survey conducted in 2011. Additionally, the survey evaluated greenhouse gas emission reductions using the United States Environmental Protection Agency's (EPA) Waste Reduction Model (WARM) methodology.

The nine facilities selected by the DANR completed the State Commodities Reporting Form, with data showing that 101,945.5 tons of materials were collected and recycled in 2022, rising to 107,323.9 tons in 2023, a 5.3 percent increase. In contrast, 71 facilities reported 131,426.8 tons of recycling in 2011. The composition analysis highlighted shifts in key materials: yard waste/organics increased from 37.0 percent in 2011 to 39.3 percent in 2023, while single-stream recycling, which was not reported in 2011, made up 35.5 percent in 2022 but decreased slightly to 32.4 percent in 2023.

Despite the growth in recycling volumes, there has not been an increase in contamination rate, suggesting improvements in sorting practices or more effective recycling behaviors. However, a comparison of contamination rates with the 2011 data is not possible, as the 2011 study did not track outgoing tons for disposal.

The GHG Emissions Analysis further supports the environmental benefits of recycling, showing a reduction of -148,643.0 MTCO₂E in 2022, which improved to -163,503.7 MTCO₂E in 2023. These reductions equate to removing approximately 35,377 and 38,914 cars from the road, respectively, underscoring the critical role of recycling in mitigating greenhouse gas emissions and the broader environmental impact of diverting materials from landfills.

1.0 Introduction

The South Dakota Department of Agriculture and Natural Resources (DANR) retained Burns & McDonnell Engineering Company, Inc. to conduct a recycling survey of nine separate recycling facilities across the state. This survey was funded under the 2021 Bipartisan Infrastructure Law, which provided financial support to enhance state and local waste management infrastructure and recycling programs.

The grant for the survey project was awarded in September 2023. The purpose of the survey is to gather data and compare it with the findings of the previous recycling survey conducted in 2011. The State of South Dakota Recycling/Diversion Report, 2011¹ collected statewide recycling and diversion data from various entities involved in solid waste management. For the 2011 survey, a voluntary recycling reporting form was sent to 118 businesses, counties, and municipalities, of which 71 responded. The results were summarized in the report. The focus of the 2011 report was to identify the methods and materials used to collect and process statewide recycling and diversion data, summarize the results of the data collected, provide an understanding of the percentages and rates calculated, and offer an overall conclusion of the State of South Dakota's recycling and diversion efforts from a solid waste management perspective.

The focus of this current survey is to analyze the composition of recyclable materials and contamination rates. This survey will serve as a vital tool to assess changes in recycling practices, contamination, and waste composition over the past decade. It will also guide the development and implementation of updated plans for post-consumer materials management. Furthermore, this report includes an analysis of greenhouse gas emission reductions using the US EPA Waste Reduction Model (WARM) methodology.

By evaluating the impact of recycling efforts on both waste diversion and emissions, the findings will support the state's future strategies for improving waste management and environmental sustainability.

1

<https://danr.sd.gov/Environment/WasteManagement/Recycling/docs/StateofSouthDakotaRecyclingReport2011.pdf>

2.0 Methods and Materials

In a virtual kick-off meeting on June 20, 2024, the DANR identified nine recycling facilities to be surveyed as part of the project.

A State Commodities Reporting Form 2024 (Form) was developed to gather recycling/diversion tonnages from entities involved in solid waste management. The Form was finalized with DANR during a virtual meeting on July 23, 2024. The Form is located in Appendix A.

The Form included the following: general facility information, communities served by the facility, types and quantities of recyclable materials collected and/or recycled for calendar years 2022 and 2023, contamination tonnages, and markets for the materials.

The Form was designed to allow facilities to report commodities that were either mixed or sorted. This was done to make filling out the reporting form more convenient, based on the collection system used by the reporter. Facilities also had the option to mark their information as 'confidential business information.' Facilities were informed that all information provided in this report is cumulative, with no individual tonnages shown for each facility.

The following approach was used for distribution and collection of survey information:

- E-mail facility contact with background on survey, how the information will be used, and inquire if willing to schedule a virtual meeting or phone call. If a facility is unwilling to participate, coordinate with DANR for alternative facility to survey.
- Schedule virtual meeting or phone call to discuss needed information.
- Send follow-up e-mail thanking representative for their time and identifying the information they agreed to forward.
- If no response is received within proposed time frame, provide one follow up e-mail and one phone call to facility.
- If unresponsive, coordinate with DANR for alternative facility to survey (not needed as all facilities contacted have reported).

Table 2-1 summarizes the information requested on the Form.

Table 2-1 Recycling Reporting Commodities

Commodities	
Paper Paper (All Mixed) Cardboard Paperboard	Aggregates Concrete Asphalt Pavement Other
Metal Residential Aluminum Cans Residential Steel Cans/Tins Cans (food containers) White Goods Auto Scrap/Shred Industrial Non-Ferrous Industrial Ferrous Other Industrial Steel	Organics Food Scraps and Processing Residuals Yard Trimmings Agricultural Organics Biosolids Sewage Sludge Other Compostables Wood Agricultural Wood Construction/Dimensional Lumber/Pallets/Crates/Shingles Forestry Secondary Materials – Mill Byproducts
Batteries Vehicle Batteries Other Batteries (AA's, etc)	Scrap Tires/Rubber Passenger Tires Commercial Tires
Plastics #1 and #2 Mixed PET #1 HDPE #2 – Natural HDPE #2 – Colored #3 and #7	Used Oil
Glass Mixed Glass Amber Glass	Anti-Freeze
Single Stream Recyclables	Electronics

3.0 Results

Nine reporting forms were emailed out to the facilities selected by the DANR. Of the nine reporting forms mailed out, Burns & McDonnell received all nine completed State Commodities Reporting Forms.

In 2022, approximately 101,945.5 tons of materials were collected and recycled at the nine facilities. In 2023, approximately 107,323.9 tons were collected and recycled, representing a 5.3 percent increase. In comparison, 71 facilities reported 131,426.8 tons of recycling in 2011. The average tonnage per surveyed facility in 2011 was 1,851.8 tons, while in 2023 it was 11,924.9 tons per facility. This could suggest that the facilities surveyed in 2023 are managing larger volumes of recycling and/or that South Dakotans are recycling more materials. However, without data from the same facilities between 2011 and 2023, no definitive conclusion can be drawn.

In 2022, approximately 696,577 tons of municipal solid waste (MSW) were disposed of at the 15 regional landfills located in South Dakota, while in 2023, approximately 730,656 tons were disposed of. These figures reflect the total MSW subject to the \$1/ton solid waste management disposal fee under South Dakota Codified Law 34A-6-81, paid to the state for all MSW disposed of at landfill facilities.

3.1 Recyclable Material Composition

Table 3-1 summarizes the commodity tonnages from the reporting nine facilities from 2022 and 2023 as well as the 71 facilities that reported in 2011.

Table 3-1 Commodity Tonnages

Commodity	Tonnage		
	2011	2022	2023
Mixed Paper	34,293.5	2,347.2	2,060.8
Cardboard	23,611.9	16,837.6	19,994.7
Metal	4,510.3	1,353.2	2,278.1
Plastic	3,217.3	186.7	207.6
Organics/Yard Waste/Wood	49,111.0	28,773.1	3,4201.1
Aggregates	--	22,196.1	19,179.3
Glass	3,317.2	42.5	45.9
Scrap Tires/Rubber	2,115.3	2,777.4	1,060.9
Used Oil	--	3.6	3.0
Electronics	2,173.5	155.0	78.0
Single Stream Recyclables	--	27,273.0	28,214.6
Other ¹	9,076.8	--	--
Total	131,426.8	101,945.5	107,323.9

¹ Not defined in State of South Dakota Recycling/Diversion Report 2011

Figure 3-1 breaks down the composition of recyclable materials collected in 2011.

Figure 3-1 MSW Recycled by Material, 2011

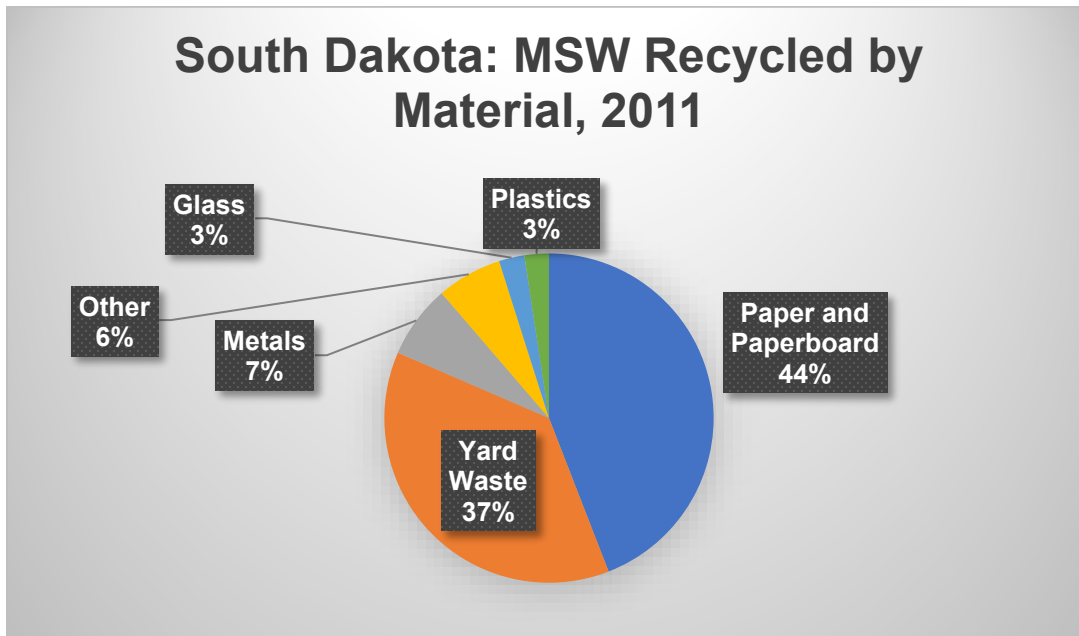


Figure 3-2 breaks down the composition of traditional recyclable materials collected in 2022 to compare it with the 2011 survey.

Figure 3-2 MSW Recycled by Material, 2022

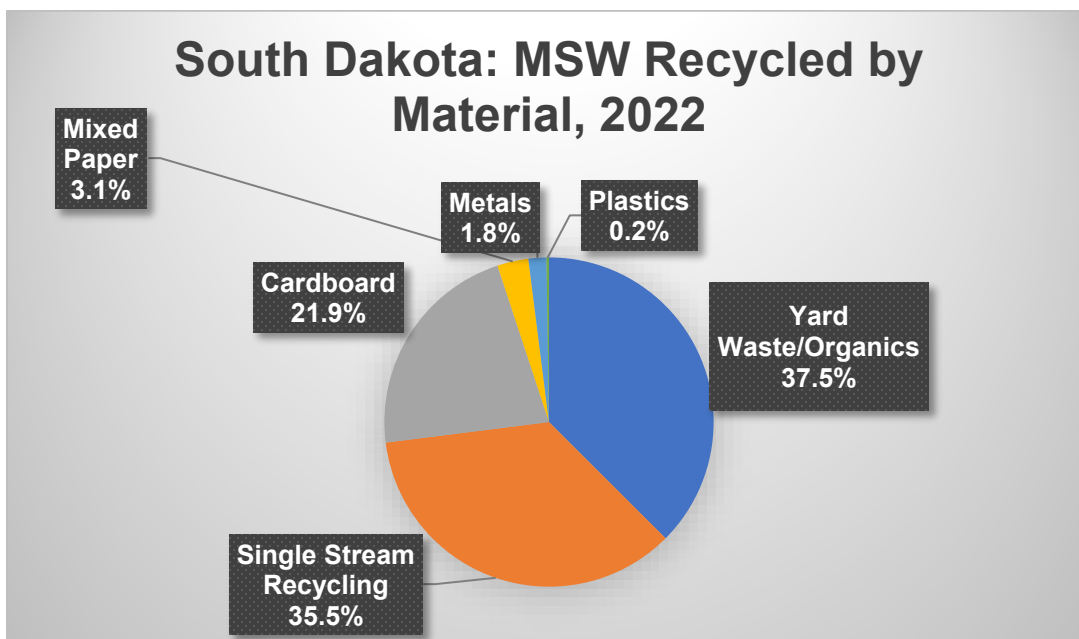
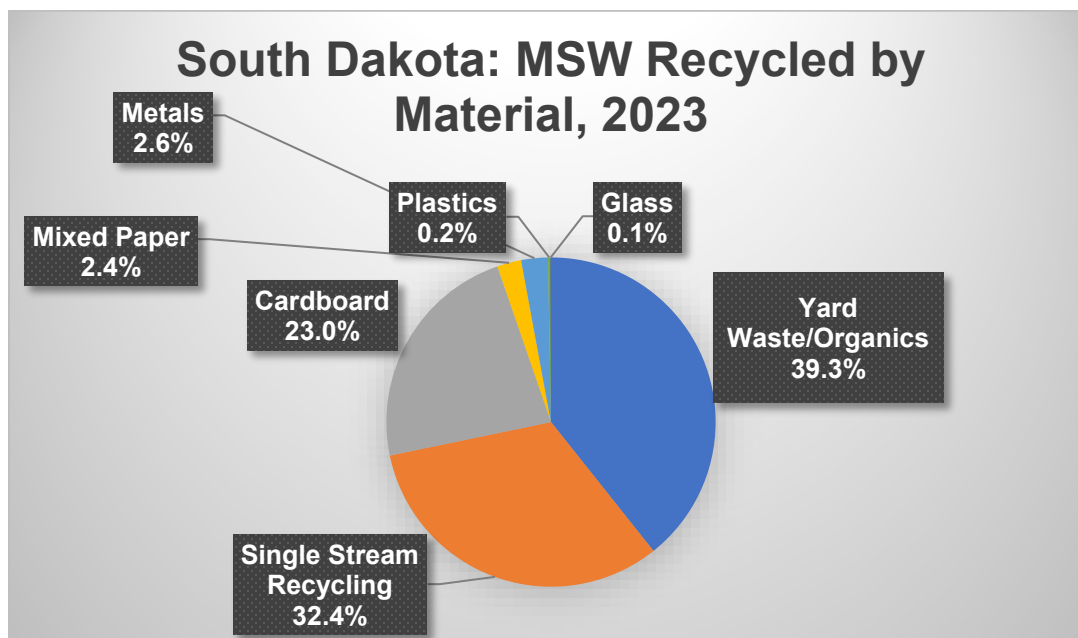


Figure 3-3 breaks down the composition of traditional recyclable materials collected in 2023 to compare it with the 2011 survey.

Figure 3-3 MSW Recycled by Material, 2023



The key observations are as follows:

1. **Yard Waste/Organics:** Yard waste/Organics consistently account for a significant portion of the recycling stream, increasing slightly from 37.0 percent in 2011 to 39.3 percent in 2023.
2. **Single-Stream Recycling:** This category represented 35.5 percent of the recycling composition in 2022 but decreased slightly to 32.4 percent in 2023. Single-stream recycling became more popular following the 2011 study and therefore was not reported in 2011. Municipalities and waste management companies widely adopted single-stream recycling because it streamlined the collection process, reduced costs, and made recycling more accessible. However, despite its popularity, single-stream recycling can lead to increased contamination rates. The 2011 study did not collect contamination data specific to South Dakota's recycling, so a comparison between source-separated recycling and single-stream recycling cannot be made for this study.
3. **Cardboard:** There has been a notable decrease in the percentage of cardboard collected, from 44 percent in 2011 to 23 percent in 2023. However, cardboard is collected as part of single-stream recycling, which likely accounts for its lower percentage in this specific category.
4. **Mixed Paper:** Mixed paper accounted for 3.1 percent of the total in 2022 but dropped slightly to 2.4 percent in 2023. In 2011, 34,293.5 tons of paper were reported. However, paper is collected as part of single-stream recycling, which likely accounts for its lower percentage in this specific category. In addition, a decrease in paper recycling can also be attributed to an increase in digitalization and reduced paper usage.
5. **Metals:** The proportion of metals recycled decreased from 7.0 percent in 2011 to 1.8 percent in 2022, but there was a slight recovery to 2.6 percent in 2023. Metals are collected as part of single-stream recycling, which likely accounts for its lower percentage in this specific category.
6. **Plastics:** Plastics represented 2 percent in 2011 but dropped to a minimal 0.2 percent in both 2022 and 2023. Plastics are collected as part of single-stream recycling, which likely accounts for its lower percentage in this specific category.

7. **Glass:** Glass recycling also declined from 3 percent in 2011 to just 0.1 percent in both 2022 and 2023. Glass can be collected as part of single-stream recycling, which may account for its lower percentage in this specific category.
8. **Other:** Table 3-1 summarizes some of the additional commodities reported by the nine facilities in this study, as well as those from 2011. These materials include aggregates (concrete and asphalt) and used oil in this study, along with a category for “other” materials in 2011. For comparison purposes, these materials were not included in the MSW recycled by material figures, as the data were reported differently.

Overall, the data shows a shift in material composition, with yard waste and single-stream recycling maintaining the highest proportions, while individual categories such as cardboard, metals, plastics, and glass have seen declines over time which could be attributed to single-stream recycling programs.

3.2 Contamination Rate

The total outgoing tons for disposal derived from recyclables saw an increase, from 2,069.0 tons to 2,425.5 tons, which is a consistent contamination rate of 2.0 percent. To assess the relationship between the increase in recycling collected and the contamination rate, the proportional increase in recycling collected can be compared with the amount of contaminated material collected.

1. Recycling Collected:

- In 2022: 101,945.5 tons
- In 2023: 107,323.9 tons
- **Increase in recycling collected: 5.3 percentage points**

2. Contamination Rate:

- 2022: 2.0 percent
- 2023: 2.0 percent
- **Change in contamination rate: 0 percentage points**

While the volume of recyclable materials collected at the surveyed facilities has increased by more than 5 percent, the contamination rate has remained consistent. The 2011 study did not collect data on the outgoing tons for disposal derived from recyclables; therefore, contamination rates from 2011 cannot be compared to those of this study.

3.3 Greenhouse Gas Emission Reduction Evaluation

The Environmental Protection Agency's (EPA) Waste Reduction Model (WARM) was developed to provide a high-level comparison of potential greenhouse gas emissions (GHG) reductions, energy savings, and economic impacts associated with different material management practices. The model calculates emissions in metric tons of carbon dioxide equivalent (MTCO₂E). For this report, the baseline scenario is recycling the materials. The tons of each commodity specifically listed were entered into the WARM model as recycled, and the only alternative management scenario for each commodity was landfilling. Table 3-2 summarizes the GHG Emissions Analysis conducted in the WARM model for recycling versus landfilling.

Table 3-2 GHG Emissions Analysis

GHG Emissions Analysis	Total MTCO ₂ E			
	2022		2023	
	Recycled	Landfilled	Recycled	Landfilled
Corrugated Containers	(52,791.6)	28,008.9	(62,238.5)	33,021.0
Mixed Paper (general)	(8,322.1)	3,385.9	(7,306.5)	2,972.7
Yard Trimmings	(3,047.3)	6,159.6	(3,622.1)	7,321.6
Mixed Plastics	(172.8)	3.8	(192.1)	4.2
Mixed Electronics	(140.1)	3.1	(70.5)	1.6
Mixed Metals	(5,942.1)	27.4	(10,003.7)	46.1
Glass	(11.7)	0.9	(12.7)	0.9
Asphalt	(738.0)	184.7	(549.3)	137.5
Concrete	(41.7)	105.7	(81.5)	206.6
Tires	(1,045.1)	56.3	(399.2)	21.5
Single Stream Recyclables	(76,390.4)	32,284.6	(79,027.6)	33,399.1
Total	(148,643.0)	70,221.0	(163,503.7)	77,132.9

The GHG Emissions Analysis for 2022 and 2023 shows a positive trend in reducing greenhouse gas emissions through recycling. In 2022, recycling efforts resulted in a total reduction of -148,643.0 MTCO₂E, which further improved to -163,503.7 MTCO₂E in 2023.

To put these reductions into perspective, the EPA estimates that the reduction of -148,643.0 MTCO₂E in 2022 is comparable to taking approximately 35,377 cars off the road for a year, while the -163,503.7 MTCO₂E reduction in 2023 equates to about 38,914 cars.

In contrast, if these materials had been landfilled instead, the emissions would have increased, rising from 70,221.0 MTCO₂E in 2022 to 77,132.9 MTCO₂E in 2023. This underscores the role recycling plays in reducing overall greenhouse gas emissions and the potential environmental impact of diverting materials from landfills. The data illustrates not only the immediate benefits of recycling but also the long-term advantages of implementing recycling initiatives.

3.4 Staffing Analysis

Also included in the survey of recycling facilities was a staffing analysis. One facility indicated that their information could only be aggregated and is not included, while three other facilities indicated that their information was confidential. Table 3-3 summarizes the results.

Table 3-3 Staffing Analysis

Name of Facility	Number of Facility Employees
Pierre Solid Waste Facility	12 Full-time employees
Rapid City Solid Waste Division	17.5 Full-time employees
City of Vermillion Solid Waste Department	5 Full-time employees
City of Winner Public Works	2 Full-time and 2 part-time employees

XXXX Facility	31 Full-time and 8 part-time employees
City of Huron Solid Waste Department	13 Full-time employees
XXXX Facility	5 Part-time employees
XXXX Facility	2 Part-time employees

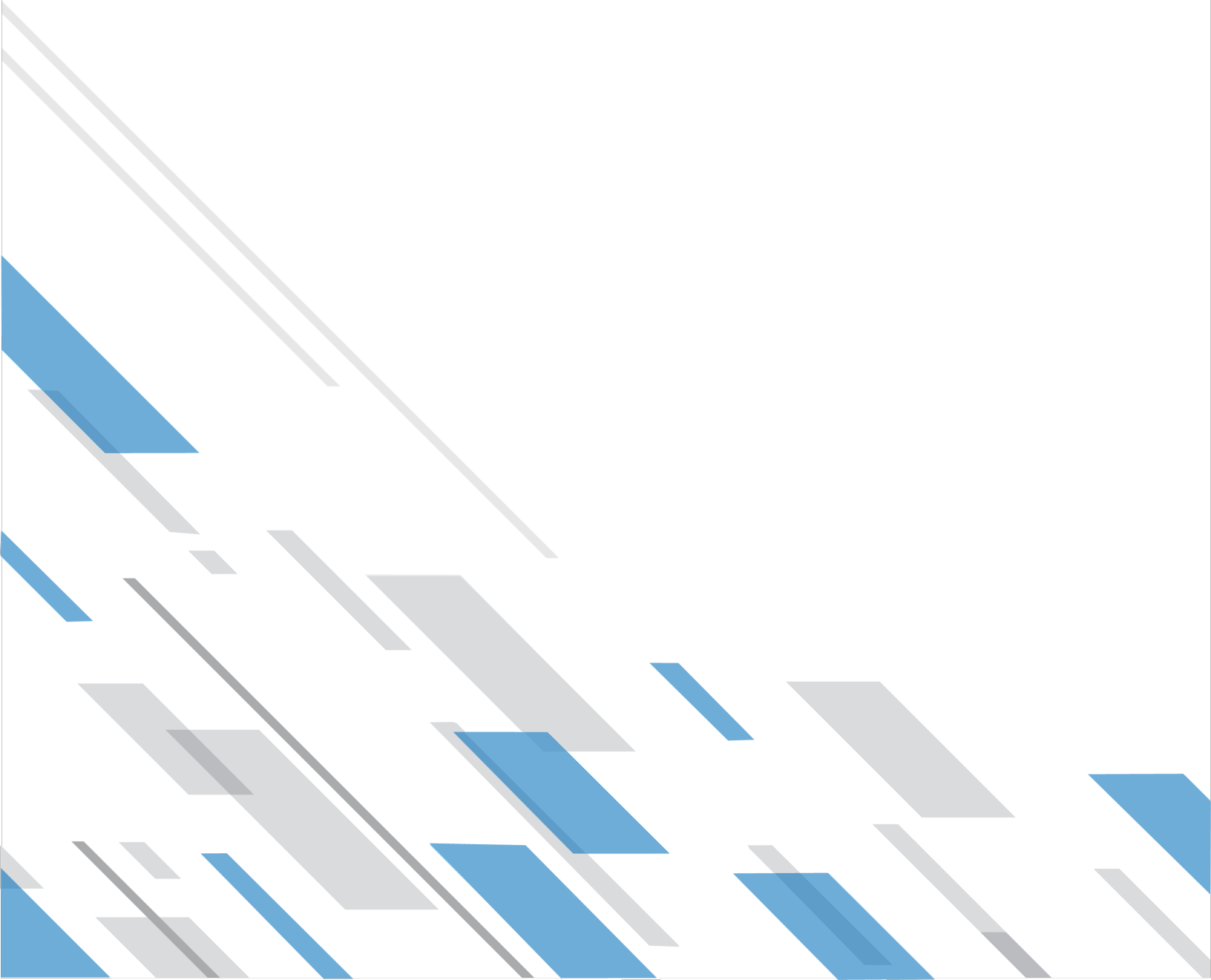
4.0 Conclusion

In conclusion, the analysis of the State Commodities Reporting Forms submitted by nine selected facilities reveals positive trends in recycling efforts. All nine facilities completed the reporting forms, and the data indicates an increase in materials collected for recycling, rising from approximately 101,945.5 tons in 2022 to 107,323.9 tons in 2023, reflecting a 5.3 percent increase. When compared to the 2011 data, which reported 131,426.8 tons across 71 facilities, it is noteworthy that the average tonnage per surveyed facility increased, from 1,851.8 tons in 2011 to 11,924.9 tons in 2023. This suggests that the facilities surveyed in 2023 may be managing larger volumes of recycling, and/or that there is an overall increase in recycling participation among South Dakotans. However, due to the lack of consistent data from the same facilities between 2011 and 2023, no definitive conclusions can be drawn about the underlying factors contributing to these trends.

The analysis indicates that while recycling efforts have expanded by more than 5 percent, the proportional increase in contamination remained consistent at 2 percent. However, it is important to note that the 2011 study did not collect data on the outgoing tons for disposal derived from recyclables, preventing a direct comparison of contamination rates between 2011 and the current study.

The GHG Emissions Analysis for 2022 and 2023 demonstrates a positive trend in reducing greenhouse gas emissions through recycling. This highlights the critical role recycling plays in reducing overall greenhouse gas emissions and emphasizes the environmental benefits of diverting materials from landfills.

APPENDIX A – STATE COMMODITIES REPORTING FORM





South Dakota Recycling Commodities Reporting Form 2024

This survey has been prepared by Burns & McDonnell Engineering Company, Inc for the South Dakota Department of Agriculture and Natural Resources.

Name of Facility: _____

of Facility Employees: Full-time _____ Part-time _____

Contact person: _____

Phone: _____

E-mail: _____

Any records in our possession identified as “confidential business information” or as a “trade secret” will not be disclosed with any other entity. To assert a claim of business confidentiality please check the box below, adding your facility information and submitting this sheet along with your reporting forms.

Yes. (check the box to claim privilege) ☐

Name of Facility: _____

Address/City/Zip Code: _____

Telephone/County: _____

Submitted By: _____

Date: _____

Submit only one confidentiality form per facility. Applies only to facility identified above.



South Dakota Recycling Commodities Reporting Form 2024

Page 2

Select Facility Type (check all that apply):

- ☐ Recycling Center ☐ Transfer Station ☐ Municipality
☐ Permitted Landfill ☐ Salvage Recycler

Services Offered (check all that apply):

- Recycling: ☐ Drop-off Sites ☐ Residential Collection
 ☐ Commercial Collection ☐ Other: _____
- Yard Waste: ☐ Drop-off Sites ☐ Residential Collection
 ☐ Commercial Collection ☐ Other: _____

List Cities/Counties Served: _____

Materials within each General Commodity grouping are organized by Sub-category, and further to Individual Commodity. **Please provide data in the most specific categories possible.**

General Commodity	Sub-category	Individual Commodity	2022 Quantity	2023 Quantity	Units	Inbound or Outbound?	End Market
Paper <i>(if broken down further, use categories below and leave blank)</i>							
		Paper (All Mixed)					
		Cardboard					
		Paperboard					
Metal <i>(if broken down further, use categories below and leave blank)</i>							
		Residential Aluminum Cans					
		Residential Steel Cans/ Tin					
		Cans (food containers)					
		White Goods					
		Auto Scrap/Shred					
		Industrial Non-Ferrous					
		Industrial Ferrous					
		Other Industrial Steel					
Batteries <i>(if broken down further, use categories below and leave blank)</i>							
		Vehicle Batteries					
		Other Batteries (AA's, etc.)					



South Dakota Recycling Commodities Reporting Form 2024

Page 3

General Commodity	Sub-category	Individual Commodity	2022 Quantity	2023 Quantity	Units	Inbound or Outbound?	End Market	
Plastics (if broken down further, use categories below and leave blank)								
	#1 and #2 Mixed							
	PET #1							
	HDPE #2 - Colored							
	HDPE #2 - Natural							
	#3 through #7							
Organics (if broken down further, use categories below and leave blank)								
	Other Organics							
		Food Scraps and Processing Residuals						
		Yard Trimmings (grass/wood chips)						
		Agricultural Organics (livestock, manure, food waste)						
		Biosolids						
		Sewage Sludge						
		Other Compostables						
	Wood							
		Agricultural Wood						
		Construction/ Dimensional Lumber/ Pallets/Crates/ Shingles						
		Forestry Secondary Materials -Mill Byproducts						
	Aggregates (if broken down further, use categories below and leave blank)							
		Concrete						
Asphalt Pavement								
Other								
Glass (if broken down further, use categories below and leave blank)								
	Mixed Glass							
	Amber Glass							
Scrap Tires/Rubber (if broken down further, use categories below and leave blank)								
	Passenger Tires							
	Commercial Tires							
Used Oil								
Anti-Freeze								
Electronics (if broken down further, use categories below and leave blank)								
	Mixed Electronics							



South Dakota Recycling Commodities Reporting Form 2024

Page 4

General Commodity	Sub-category	Individual Commodity	2022 Quantity	2023 Quantity	Units	Inbound or Outbound?	End Market
		Monitors & TVs					
Single Stream Recyclables							
Check materials in your Single Stream collection: ☐ Cardboard ☐ Paper ☐ Plastic ☐ Metal ☐ Glass ☐ Other:							
Other Materials							
	Material:						
	Material:						
	Material:						

Contamination Rate	Disposal Facility	2022 Quantity	2023 Quantity	Units
Total Outgoing Tons for Disposal				