NATIONAL ASPHALT PAVEMENT ASSOCIATION

Asphalt Pavement Industry Survey on

Recycled Materials and Warm-Mix Asphalt Usage 2021

Information Series 138

NAPA ● 6406 Ivy Lane, Suite 350 ● Greenbelt, MD 20770-1441
Tel: 301-731-4748 ● Fax: 301-731-4621
Toll free: 1-888-468-6499 ● AsphaltPavement.org

12th Annual Asphalt Pavement Industry Survey
IS 138
Produced December 2022

Technical Report Documentation Page

1. Report No.	2. Government Accession No.	3. Recipient's Catalog No.
Information Series 138 (12th edition)		

4. Title and Subtitle	5. Report Date
Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2021	December 2022
	6. Performing Organization Code

7. Author(s)	8. Performing Organization Report No.
Brett A. Williams, J. Richard Willis, Ph.D., & Joseph Shacat	IS 138(12e)

9. Performing Organization Name and Address	10. Work Unit No. (TRAIS)
National Asphalt Pavement Association 6406 Ivy Lane, Suite 350 Greenbelt, MD 20770-1441	**11. Contract or Grant No.** HIF180121PR

12. Sponsoring Organization Name and Address	13. Type of Report and Period Covered
Federal Highway Administration Office of Preconstruction, Construction, and Pavements 1200 New Jersey Ave. SE Washington, DC 20590	Final Report; January–December 2021
	14. Sponsoring Agency Code FHWA-HICP-40

15. Supplementary Notes

FHWA Agreement Officer's Representative: Timothy B. Aschenbrener, P.E.

16. Abstract

A shared goal of the Federal Highway Administration (FHWA) and the National Asphalt Pavement Association (NAPA) is to support and promote sustainable practices, such as the use of recycled materials and warm-mix asphalt (WMA). The use of recycled materials, primarily reclaimed asphalt pavement (RAP) and reclaimed asphalt shingles (RAS), in asphalt pavements conserves raw materials and reduces overall asphalt mixture costs, as well as reduces the stream of material going into landfills.

WMA technologies have been introduced to reduce production and compaction temperatures for asphalt mixtures, which reduces the energy needed and emissions associated with mixture production. Additional benefits include improved low-temperature compaction of asphalt mixtures leading to improved pavement performance, as well as a longer paving season. WMA was chosen for accelerated deployment in Federal-Aid Highway, State Department of Transportation, and local road projects as part of FHWA's 2010 Every Day Counts initiative.

The objective of this survey, first conducted for the 2009 and 2010 construction seasons, is to quantify recycled materials used and WMA produced annually by the asphalt pavement industry to document the deployment of these technologies to understand where they are being used and where they are underutilized. Results show significant growth in the use of RAP, RAS, and WMA technologies since 2009, although the rate of year-over-year growth has generally slowed since 2013.

The asphalt industry remains the country's most diligent recycler with more than 99 percent of reclaimed asphalt pavement being put back to use. The average percentage of RAP used in asphalt mixtures has increased from 15.6 percent in 2009 to 21.9 percent in 2021. In 2021, the estimated RAP tonnage used in asphalt mixtures was 94.6 million tons. This represents 4.7 million tons (26 million barrels) of asphalt binder conserved, along with the replacement of more than 89 million tons of virgin aggregate. The use of RAS in asphalt pavement mixtures has decreased from 701,000 tons in 2009 to an estimated 630,000 tons in 2021 with the use of RAS increasing (7 percent) from 2020 to 2021.

The combined savings of asphalt binder and aggregate from using RAP and RAS in asphalt mixtures is estimated at more than $3.5 billion and nearly 62 million cubic yards of landfill space.

More than 1.3 million tons of other recycled materials were reported as being incorporated into nearly 9.2 million tons of asphalt pavement mixtures during the 2021 construction season, including recycled tire rubber, blast furnace slag, steel slag, and cellulose fibers.

The estimated total production of asphalt with WMA technologies during the 2021 construction season was 177.9 million tons of which about 53 percent was produced at reduced temperatures. This was a 5 percent decrease from the estimated 186.4 million tons of WMA in 2020. Utilization of WMA technologies in 2021 was 959 percent more than the estimated 16.8 million tons in the 2009 construction season.

Asphalt produced with WMA technology made up 41.1 percent of the total estimated asphalt mixture market in 2021. Chemical additive technologies, representing 60 percent of the market, is the most commonly used warm-mix technology; production plant foaming accounted for nearly 38 percent of the market. Differences were seen in which WMA technologies were used when production temperatures were or were not reduced.

17. Key Words	18. Distribution Statement
reclaimed asphalt pavement, reclaimed asphalt shingles, warm-mix asphalt, recycled tire rubber, ground tire rubber, slag, fly ash, RAP, RAS, WMA, GTR, RTR, recycled materials, economics, engineering	No restrictions.

19. Security Classification (of this report)	20. Security Classification (of this page)	21. No. of Pages	22. Price
Unclassified.	Unclassified.	51	NA

Form DOT F 1700.7 (8-72) **Reproduction of completed page authorized**

Table of Contents

Suggested Citation:

Williams, B.A., J.R. Willis, & Shacat, J. (2022). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2021, 12th Annual Survey* (IS 138). National Asphalt Pavement Association, Greenbelt, Maryland. DOI:10.13140/RG.2.2.23149.26081

List of Abbreviations

AASHTO	American Association of State Highway and Transportation Officials
CCP	Coal Combustion Product
CCPR	Cold Central Plant Recycling
CIR	Cold In-Place Recycling
DOT	Department of Transportation
FDR	Full-Depth Reclamation
FHWA	Federal Highway Administration
GHG	Greenhouse Gas
GTR	Ground Tire Rubber
HIR	Hot In-Place Recycling
HMA	Hot-Mix Asphalt
MWAS	Manufacturing Waste Asphalt Shingles
NAPA	National Asphalt Pavement Association
NCAT	National Center for Asphalt Technology
NCAUPG	North Central Asphalt User/Producer Group
NEAUPG	North East Asphalt User/Producer Group
NSA	National Slag Association
PCAS	Post-Consumer Asphalt Shingles
PCCAS	Pacific Coast Conference on Asphalt Specifications
RAP	Reclaimed Asphalt Pavement
RAS	Reclaimed Asphalt Shingles
RMAUPG	Rocky Mountain Asphalt User/Producer Group
RTR	Recycled Tire Rubber
SAPA	State Asphalt Pavement Association
SEAUPG	Southeastern Asphalt User/Producer Group
UPG	User/Producer Group
WMA	Warm-Mix Asphalt

Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2021

Executive Summary

The results of the asphalt pavement industry survey for the 2021 construction season show that asphalt mixture producers have a strong record of employing sustainable practices and continue to increase their use of recycled materials and warm-mix asphalt (WMA). The use of recycled materials, particularly reclaimed asphalt pavement (RAP) and reclaimed asphalt shingles (RAS), conserves raw materials and reduces overall asphalt mixture costs, allowing road owners to achieve more roadway maintenance and construction activities within limited budgets. WMA technologies can improve compaction at reduced temperatures, ensuring pavement performance and long life; conserve energy; reduce emissions from production and paving operations; and improve conditions for workers.

The objective of this survey, first conducted for the 2009 and 2010 construction seasons, was to quantify the use of recycled materials, primarily RAP and RAS, as well as the use of WMA technologies by the asphalt pavement industry. For the 2021 construction season, the National Asphalt Pavement Association (NAPA) conducted a voluntary survey of asphalt mixture producers across the United States on tons produced, along with a survey of State Asphalt Pavement Associations (SAPAs) regarding total tons of asphalt pavement mixture produced in their State.

Asphalt mixture producers from 50 States, and the District of Columbia completed the 2021 construction season survey. A total of 261 companies and 1,388 production plants were represented in the survey.

A degree of fluctuation in year-to-year comparisons of data is influenced by which companies responded to the 2021 construction season survey versus prior year survey respondents. Respondents to the 2021 construction season survey decreased by 13 companies compared to 2020. Of the companies responding to the 2021 survey, 31 did not respond to the 2020 construction season survey.

The following are highlights of the survey of usage during the 2021 construction season:

Reclaimed Asphalt Pavement

- Asphalt mixture producers remain the country's most diligent recyclers, with more than 95 percent of asphalt mixture reclaimed from old asphalt pavements being put back to use in new pavements and the remaining 5 percent being used in other civil engineering applications, such as unbound aggregate bases.
- The total estimated tons of RAP used in asphalt mixtures was 94.6 million tons in 2021. This represents a 68.9 percent increase from the total estimated tons of RAP used in 2009. Since 2009, total asphalt mixture tonnage has increased only 20.6 percent.
- The percentage of producers reporting use of RAP was at 100 percent of respondents, up 1.1 percent from 2020. Two producers reported landfilling a minor amount (36,000 tons, or 0.07 percent) of RAP during 2021.
- RAP usage during the 2021 construction season is estimated to have reduced the need for 4.7 million tons (26 million barrels) of asphalt binder and more than 89 million tons of aggregate with a total estimated value of more than $3.4 billion.
- The total estimated amount of RAP stockpiled nationwide at the end of the 2021 construction season was about 137 million tons.
- Fractionated RAP represents about 25 percent of RAP use nationwide, and the tons of RAP mixtures produced using softer binders are estimated at 22 percent while tons produced using recycling agents is estimated at 5 percent.
- Reclaiming 101 million tons of RAP for future use saved about 61.5 million cubic yards of landfill space, and more than $5.1 billion in gate fees for disposal in landfills.

- The use of RAP in new asphalt mixtures reduced greenhouse gas emissions in 2021 by 2.6 million metric tons of CO_{2e}, which is equivalent to the annual emissions of more than 570,000 passenger vehicles

Reclaimed Asphalt Shingles

- The total estimated tons of RAS used in asphalt mixtures increased 8 percent to an estimated 630,000 tons in 2021. The increase in the use of RAS reported during the 2021 construction season still leaves utilization at about 68 percent below the 2014 peak level of reported usage.
- The total estimated amount of RAS stockpiled nationwide at the end of the 2021 construction season was about 1.13 million tons, an 11 percent decrease from 2020.
- RAS usage during the 2021 construction season is estimated to have reduced the need for 126,000 tons (more than 690,000 barrels) of asphalt binder and about 315,000 tons of aggregate with a total estimated value of more than $69 million.
- Reclaiming 395,000 tons of unprocessed RAS for future use saved about 240,000 cubic yards of landfill space, and more than $21 million in gate fees for disposal in landfills.

Other Findings

- The use of softer binders and recycling agents with mixtures incorporating RAP and RAS was reported nationwide. There was little correlation between the level of RAP and RAS used and the use of softer binders and/or recycling agents.
- Other recycled materials commonly reported as being used in asphalt mixtures during the 2021 construction season were recycled tire rubber, blast furnace slag, steel slag, cellulose fibers, and fly ash.
- More than 1.3 million tons of other recycled materials was reported as being used in nearly 9.2 million tons of asphalt mixtures by 68 companies in 32 States during the 2021 construction season.

Warm-Mix Asphalt Technologies

- The estimated total tonnage of asphalt pavement mixtures produced with WMA technologies for the 2021 construction season was 177.9 million tons. This was a 5 percent decrease from the estimated 186.4 million tons of WMA in 2020, led by decreased WMA tonnage in the DOT and Other Agency sectors.
- Mixtures produced with WMA technologies made up 41.1 percent of the total estimated asphalt mixture market in 2021. About 52.8 percent (94.1 million tons) of these mixtures were produced with a temperature reduction of at least 10°F.
- Production plant foaming, representing nearly 38 percent of the market in 2021, was no longer the most commonly used warm-mix technology, decreasing about 57.7 percent since its peak in the 2011 construction season.
- Chemical additive technologies accounted for 60 percent of the market in 2021, a significant increase from their use (46 percent) in the 2020 construction season.
- About 62 percent of survey respondents produce asphalt with WMA technologies; 161 producers in 45 States reported using WMA technologies.
- The use of WMA technologies to produce asphalt mixture at reduced temperatures reduced greenhouse gas emissions in 2021 by 0.08 million metric tons of CO_{2e}, which is equivalent to the annual emissions of 17,000 passenger vehicles.

Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2021

Background

A shared goal of the Federal Highway Administration (FHWA) and the National Asphalt Pavement Association (NAPA) is to support and promote sustainable practices, such as incorporation of recycled materials in pavement mixtures and the use of warm-mix asphalt (WMA) technologies. Reclaimed asphalt pavement (RAP) is recycled at a greater rate than any other material in the United States and helps lower overall material costs, allowing road owners to achieve more roadway maintenance and construction activities within limited budgets. Another recycled material used in asphalt mixtures is reclaimed asphalt shingles (RAS) from both manufacturing waste (MWAS) and post-consumer asphalt shingles (PCAS). The use of RAP and RAS in asphalt pavements can reduce the amount of new asphalt binder and aggregates required in mixtures, which can help stabilize the price of asphalt mixtures and save natural resources. Other recycled materials commonly incorporated into asphalt pavements include recycled tire rubber (RTR), steel and blast furnace slags, and cellulose fibers. By putting waste materials and byproducts to a practical use, the asphalt pavement industry helps reduce the amount of material going to landfills while improving the sustainability of asphalt mixtures.

WMA technologies reduce the mixing and compaction temperatures for asphalt mixtures. Environmental benefits include reductions in both fuel consumption and air emissions. Construction benefits include the ability to extend the paving season into the cooler months, haul material longer distances, improve compaction at lower temperatures, and use higher percentages of RAP (Prowell et al., 2012; West et al., 2014). As part of FHWA's original group of Every Day Counts initiatives, WMA was chosen in 2010 for accelerated deployment in Federal-Aid Highway, State Department of Transportation (DOT), and local road projects (FHWA, 2013). In 2013, WMA was honored with the Construction Innovation Forum's NOVA Award for its engineering, economic, and environmental benefits (CIF, 2013).

FHWA works closely with the pavement industry through associations and other stakeholders to promote pavement recycling technologies and WMA. From 2007 to 2011, the American Association of State Highway and Transportation Officials (AASHTO) conducted a biennial survey of State DOT use of recycled materials (Copeland et al., 2010; Copeland, 2011; Pappas, 2011) and results were presented at FHWA Expert Task Group meetings. FHWA partners with NAPA to document industry use of RAP, RAS, other recycled materials, as well as WMA technologies used by asphalt mixture producers. These efforts have established a baseline for RAP, RAS, and WMA usage, and have tracked the growth in use of these sustainable practices by the road construction industry since 2009.

FHWA first partnered with NAPA to capture annual RAP, RAS, and WMA use for the 2009 construction season (Hansen & Newcomb, 2011; Hansen & Copeland, 2013a; 2013b; 2014; 2015; 2017; Hansen et al., 2017; Williams et al., 2018; 2019; 2020, 2021). Compared to the findings of the first survey (Hansen & Newcomb, 2011), asphalt mixture producers have shown significant growth in the use of these technologies, although the year-over-year rate of growth has slowed since the 2013 construction season. Since 2012, the survey has also asked about other recycled materials used in asphalt mixtures. Prior-year versions of this report are available at *https://www.asphaltpavement.org/expertise/sustainability/sustainability-resources/recycling*.

This report documents the results of the industry survey for the 2021 construction season, including the results, trends, and changes from 2009 through 2021. The survey methodology and survey instrument are included in Appendix A, and State-level data are included in Appendix B.

Objective and Scope

The objective of this effort is to quantify the use of recycled materials and WMA technologies by the asphalt pavement industry. From January to August 2022, NAPA fielded a voluntary survey of asphalt mixture producers in the United States on tons produced, along with a survey of State asphalt pavement associations (SAPAs) regarding total tons of asphalt pavement mixture produced in their State during the 2021 construction season. While keeping specific producer data confidential, NAPA staff compiled the amount of asphalt mixtures produced; the amount of RAP, RAS, and other recycled material used; and the amount of WMA produced in the United States. A separate survey was conducted in parallel to document the use of in-place asphalt pavement recycling techniques, which include full-depth reclamation (FDR), cold in-place recycling (CIR), hot in-place recycling (HIR), and cold central plant recycling (CCPR).

Survey Methodology

The survey methodology used to collect and analyze the data in this report is detailed in Appendix A. Note that when reporting data at the State-level, to keep specific producer information confidential, no State-specific results are provided in the tables or appendixes if fewer than three producers from that State responded to the survey. Information from States with fewer than three responding companies is included in the estimated National values, however.

Producer Survey Results

Asphalt mixture producers from 50 States, and the District of Columbia completed the survey for the 2021 construction season. A total of 261 companies and a total of 1,388 production plants are represented in the 2021 survey. The reported total asphalt mixture tons for 2021 was 198.1 million tons, and the average tons produced per plant Increased from 2020 levels to in line with the 2018 average.

A degree of fluctuation in year-to-year comparisons of data is influenced by which companies responded to the 2021 construction season survey versus prior-year survey respondents. For the 2021 construction season survey, there was a 4.7 percent decrease in the total number of companies responding and a 1.3 percent decrease in the number of plants; 12 percent of companies and 8 percent of the plants responding in 2021 did not participate in the 2020 survey. About 7.7 percent of responding companies, representing about 3.8 percent of the total reported tonnage, were not NAPA members.

Table 1 summarizes the number of asphalt mixture production companies and the number of production plants reporting for each State. Branches, subsidiaries, and operating units are counted as unique companies in Table 1 and throughout this report.

Table 1: Number of Companies Completing 2021 Construction Season Survey in Each State/Territory

State	Cos.	Prod. Plants	State	Cos.	Prod. Plants	State	Cos.	Prod. Plants
Alabama	7	49	Kentucky	7	42	Ohio	9	89
Alaska	*	*	Louisiana	3	9	Oklahoma	10	43
American Samoa	NCR	NCR	Maine	6	25	Oregon	4	12
Arizona	3	22	Maryland	9	18	Pennsylvania	8	42
Arkansas	7	24	Massachusetts	6	12	Puerto Rico	NCR	NCR
California	4	41	Michigan	7	46	Rhode Island	*	*
Colorado	6	22	Minnesota	6	41	South Carolina	10	46
Connecticut	*	*	Mississippi	5	25	South Dakota	*	*
Delaware	*	*	Missouri	4	17	Tennessee	9	53
District of Columbia	*	*	Montana	*	*	Texas	6	66
Florida	5	37	Nebraska	*	*	U.S. Virgin Islands	NCR	NCR
Georgia	5	47	Nevada	4	7	Utah	7	17
Guam	NCR	NCR	New Hampshire	3	15	Vermont	*	*
Hawaii	3	10	New Jersey	3	17	Virginia	10	39
Idaho	5	19	New Mexico	*	*	Washington	7	36
Illinois	18	51	New York	9	49	West Virginia	3	15
Indiana	6	55	North Carolina	9	84	Wisconsin	3	67
Iowa	5	14	North Dakota	*	*	Wyoming	*	*
Kansas	3	19	No. Mariana Islands	NCR	NCR	**Total†**	261	1388

NCR = No Companies Responding
* = Fewer than 3 Companies Reporting
† = Total includes companies/production plants from States with fewer than 3 companies reporting

Table 2 summarizes the total number of companies and production plants responding in previous years, as well as the average tons of asphalt pavement mixture produced by each plant.

Table 2: Summary of Jurisdictions (States or Territories), Companies, and Production Plants Responding, 2009–2021

Year	No. Jurisdictions Reporting	No. of Companies Reporting	No. of Production Plants Represented in Survey	Average Tons Produced per Plant
2009	48	196	1,027	121,000
2010	48	196	1,027	117,000
2011	49	203	1,091	121,000
2012	49	213	1,141	122,000
2013	52	249	1,281	115,000
2014	50	228	1,185	127,000
2015	49	214	1,119	137,000
2016	50	229	1,146	136,000
2017	52	237	1,146	141,000
2018	52	272	1,328	143,000
2019	50	212	1,101	147,000
2020	51	274	1,406	138,000
2021	51	261	1,388	143,000

Table 3 includes State-by-State 2021 construction season total estimated asphalt mixture tonnage, as estimated by the SAPA or from Equation A1 (see Survey Methodology in Appendix A); tonnage reported by survey respondents; and the percentage of reported tons included in estimated tons. The closer a State's percentage is to 100 percent indicates the completeness of reported tonnage compared to estimated tonnage. At the National level, survey responses make up 46 percent of the estimated total tons for the 2021 construction season.

Table 3: Summary of 2021 Estimated and Reported Asphalt Mixture Tons in Each State

State	Tons, Millions		Reported % of Estimated	State	Tons, Millions		Reported % of Estimated
	Estimated	Reported			Estimated	Reported	
Alabama	7.0	5.5	79%	Montana	4.5	*	*
Alaska	5.5	*	*	Nebraska	3.1	*	*
American Samoa	0.02	NCR	NCR	Nevada	3.7	1.6	43%
Arizona	7.9	3.2	41%	New Hampshire	1.6	1.6	98%
Arkansas	6.0	2.8	47%	New Jersey	10.5	3.7	35%
California	27.2	9.2	34%	New Mexico	4.0	*	*
Colorado	9.1	3.6	40%	New York	18.5	4.5	24%
Connecticut	3.0	*	*	North Carolina	14.0	9.7	69%
Delaware	1.6	*	*	North Dakota	2.6	*	*
District of Columbia	1.5	*	*	No. Mariana Isl.	0.02	NCR	NCR
Florida	19.0	7.4	39%	Ohio	14.8	13.2	89%
Georgia	14.5	6.5	45%	Oklahoma	5.1	5.1	99%
Guam	0.1	NCR	NCR	Oregon	5.5	1.8	33%
Hawaii	1.0	0.6	60%	Pennsylvania	20.0	5.7	29%
Idaho	3.0	1.3	43%	Puerto Rico	1.4	NCR	NCR
Illinois	14.9	7.2	48%	Rhode Island	2.2	*	*
Indiana	14.0	10.3	74%	South Carolina	7.1	7.1	99%
Iowa	4.9	1.7	35%	South Dakota	3.0	*	*
Kansas	4.0	2.4	60%	Tennessee	9.5	6.1	64%
Kentucky	7.5	3.6	48%	Texas	44.7	8.7	19%
Louisiana	8.1	1.6	20%	U.S. Virgin Isl.	0.1	NCR	NCR
Maine	2.9	2.9	99%	Utah	3.7	2.8	76%
Maryland	6.6	3.3	50%	Vermont	2.0	*	*
Massachusetts	7.0	1.8	26%	Virginia	11.5	6.6	57%
Michigan	14.7	8.9	61%	Washington	6.2	4.6	74%
Minnesota	9.2	8.6	93%	West Virginia	3.8	2.1	55%
Mississippi	5.4	3.4	63%	Wisconsin	13.0	8.8	68%
Missouri	8.0	2.5	31%	Wyoming	2.7	*	*
				Total	432.4	198.1†	46%

NCR No Companies Responding

***** Fewer than 3 Companies Reporting

† Total Reported Tons includes values from State with fewer than 3 Companies Reporting

SAPA Estimated Tons

Numbers do not add up exactly due to rounding

Figure 1 shows the number of production plants, as well as the average tons produced per production plant, separated by User/Producer Group (UPG) region. The number of production plants responding from each UPG region decreased from 2020 to 2021 apart from the Southeastern Asphalt User/Producer Group (SEAUPG) region increasing by 98 facilities. The SEAUPG region saw a decrease in tonnage produced per plant during the 2021 construction season while the North East Asphalt User/Producer Group (NEAUPG), North Central Asphalt User/Producer Group (NCAUPG), Rocky Mountains Asphalt User/Producer Group (RMAUPG) and Pacific Coast Conference on Asphalt Specification (PCCAS) all had increases in tonnage produced per plant.

NEAUPG

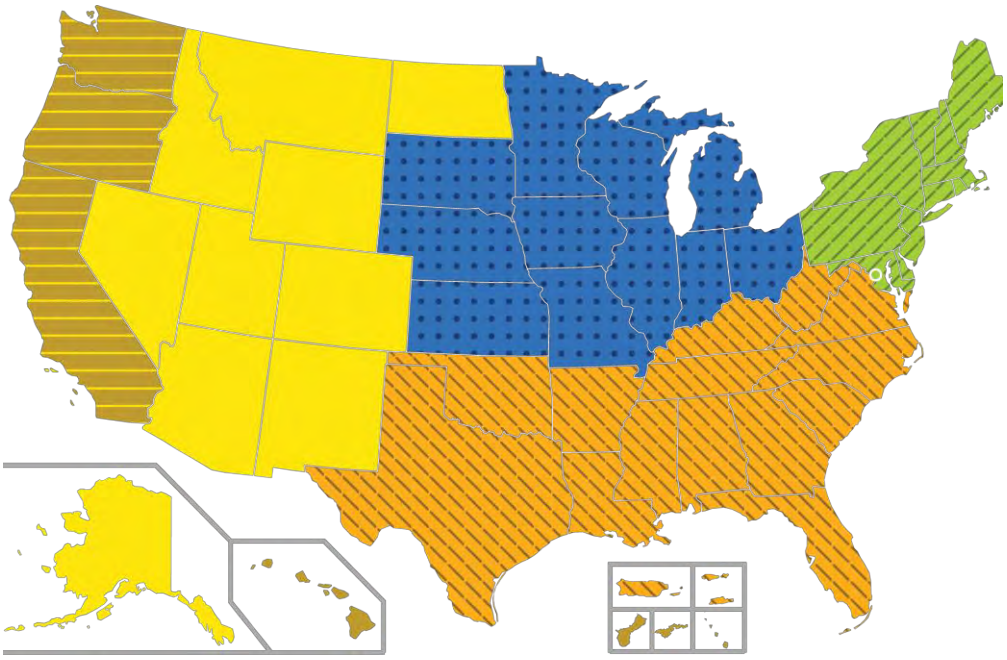
Year	Plants	Tons/Plant
2009	232	123,000
2010	232	122,000
2011	195	115,000
2012	252	119,000
2013	258	111,000
2014	193	122,000
2015	207	137,000
2016	218	136,000
2017	239	142,000
2018	247	144,000
2019	186	138,000
2020	237	132,000
2021	202	135,000

NCAUPG

Year	Plants	Tons/Plant
2009	239	106,000
2010	239	106,000
2011	311	114,000
2012	298	116,000
2013	377	123,000
2014	374	136,000
2015	324	152,000
2016	313	136,000
2017	337	153,000
2018	373	153,000
2019	295	152,000
2020	422	147,000
2021	405	158,000

SEAUPG

Year	Plants	Tons/Plant
2009	348	106,000
2010	348	106,000
2011	406	114,000
2012	430	116,000
2013	434	113,000
2014	416	125,000
2015	402	129,000
2016	401	140,000
2017	386	134,000
2018	502	135,000
2019	415	146,000
2020	481	134,000
2021	579	132,000



RMAUPG **PCCAS**

Year	Plants	Tons/Plant
2009	208	118,000
2010	208	112,000
2011	179	124,000
2012	161	113,000
2013	212	110,000
2014	202	122,000
2015	186	123,000
2016	214	128,000
2017	184	134,000
2018	206	157,000
2019	205	146,000
2020	266	142,000
2021	202	151,000

Figure 1: Number of Production Plants Responding to Survey by User/Producer Group Region and Estimated Tonnage Per Plant, 2009–2021

Data Summary and National Estimates

Table 4: Summary of RAP, RAS, WMA Data

NATIONAL SUMMARY					
Material	**Sectors**	**Reported Values**		**Estimated Values**	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	194.0	198.1	407.8	432.4
	DOT	77.5	78.7	162.8	171.8
	Other Agency	52.5	53.9	110.5	117.6
	Commercial & Residential	64.0	65.5	134.5	143.1
	No. of Companies Reporting	274	261		
RAP (Tons, Millions)	Accepted	48.7	48.3	96.3	101.3
	Used in HMA/WMA Mixtures	44.9	45.9	87.0	94.6
	Used as Aggregate	3.1	2.0	5.8	4.2
	Used in Cold-Mix Asphalt	0.2	0.1	0.4	0.1
	Used in Other	0.1	0.1	0.3	0.2
	Landfilled	0.1	0.04	0.2	0.1
	Total Tons of RAP Stockpiled at Year-End	71.5	59.82	135.3	137.5
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	19.7%	20.8%		
	Average % for Other Agency Mixtures[1]	20.0%	20.8%		
	Average % for Commercial & Residential Mixtures[1]	24.0%	25.1%		
	National Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			21.3%	21.9%
RAP	No. of Companies Reporting Using RAP	271	261		
RAS (Tons, Thousands)	Unprocessed PCAS Shingles Accepted	132	105	277	230
	Unprocessed MWAS Shingles Accepted	113	76	237	165
	Processed Shingles Accepted	132	176	278	385
	Used in HMA/WMA Mixtures	279	289	586	630
	Used as Aggregate	0	1	0	3
	Used in Cold-Mix Asphalt	0	0	0	0
	Used in Other	26	0	55	0
	Landfilled	0	0	0	0
	Total Tons of RAS Stockpiled at Year-End	605	519	1,272	1,132
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.128%	0.115%		
	Average % for Other Agency Mixtures[1]	0.130%	0.133%		
	Average % for Commercial & Residential Mixtures[1]	0.156%	0.174%		
	National Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.144%	0.146%
RAS	No. of Companies Reporting Using RAS	57	65		
WMA Technologies	Total Tons Produced With WMA Technology at Reduced Temperature			93.1	94.1
	Total Tons Produced With WMA Technology at HMA Temperatures			93.3	83.8
	DOT	51.9%	42.5%	84.5	73.0
	Other Agency	45.2%	38.3%	49.9	45.1
	Commercial & Residential	38.6%	41.8%	52.0	59.8
	No. of Companies Reporting Using WMA Technologies	184	161		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.
[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

Table 4 summarizes the RAP, RAS, and WMA data from the 2021 construction season survey alongside data from the 2020 construction season survey (Williams et al., 2021) for comparison. The information requested in the survey is summarized in Appendix A. In the column labeled "Reported Values" are National summaries of the values from asphalt mixture producers completing the survey. The column labeled "Estimated Values" for the category labeled "Tons of HMA/WMA Produced" was determined as outlined in the Survey Methodology section of Appendix A.

For the amount of RAP accepted, asphalt mixture producers were asked “How many tons of removed asphalt pavement and asphalt millings were accepted/delivered to your facilities in the State in 2021?” For the amount of RAS accepted, producers were asked “How many tons of shingles were accepted/delivered to your facilities in the State in 2021?” Producers were asked to report tons of unprocessed PCAS and unprocessed MWAS accepted/delivered, as well as tons of processed RAS acquired from shingle processors. These data are reported in Table 4 as the tonnage of material accepted. Producers were also asked for the tonnage of RAP and RAS used in the production of asphalt pavement mixtures, cold-mix asphalt, as aggregate, or for other purposes, such as in a chip seal. The tons of reclaimed material sent to landfills were also requested, along with the tons of material stockpiled at year-end.

For each State, the tons of RAS and RAP reported as accepted and used were multiplied by the ratio of total estimated production to total reported production, and these values were summed to arrive at the National estimated tons for these materials, which is reported in the “Estimated Values” column of Table 4.

To understand the average percentage of recycled material used in mixtures, producers were asked to report the percent of RAP or RAS averaged across all asphalt mixtures produced for each sector (DOT, Other Agency, Commercial & Residential). If precise data were not available, respondents were asked to provide their best estimate. These responses are reported in the “Average % Used in Mixtures” section of Table 4 for RAP and RAS. A “National Average All Mixtures Based on Tons Used in HMA/WMA” was calculated and reported in Table 4 for both RAP and RAS based on reported tonnage of each material used in HMA/WMA mixtures divided by the total reported tons produced. Producers were not asked about allowable RAP or RAS limits or binder replacement requirements, which can influence demand for mixtures that incorporate these materials.

Producers were asked to give their best estimate of the percentage of tons of asphalt paving mixture produced for each sector using WMA technologies with a temperature reduction of at least 10°F. A separate question was asked about the percentage of tons of asphalt paving mixture produced for each sector with WMA technologies but without reducing production temperatures. These percentages were multiplied by the total mixture production for each sector to determine the total estimated tons of asphalt mixture produced using WMA technologies for each sector.

Total Asphalt Mixture Production

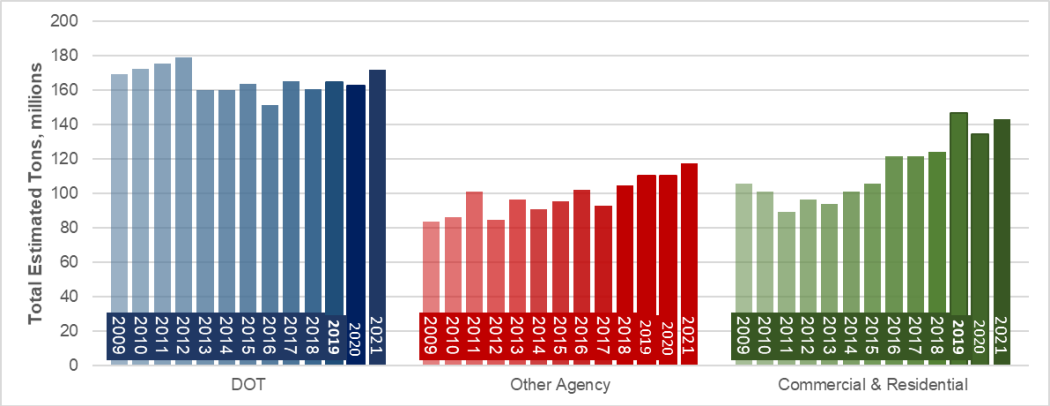


Figure 2a: Estimated Total Asphalt Mixture Production by Sector, 2009–2021

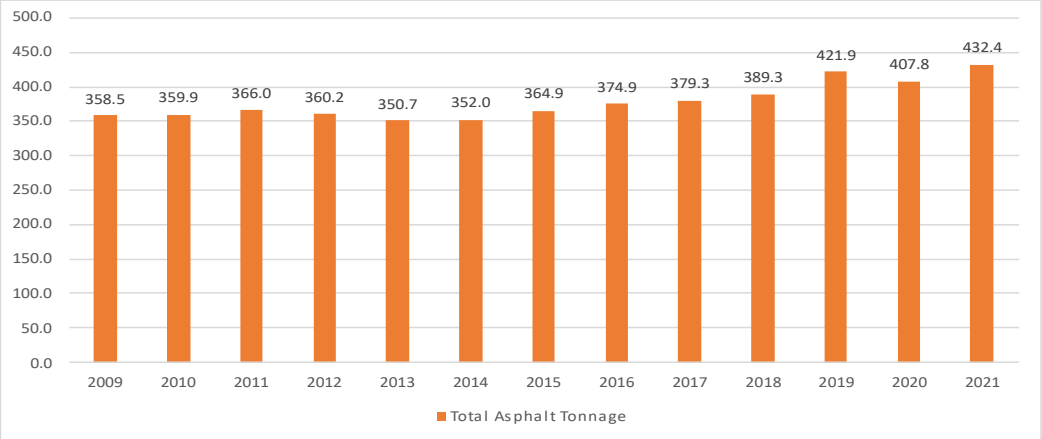


Figure 2b: Estimated Total Asphalt Mixture Production in Total, 2009–2021

Table 4 includes the National summary of asphalt mixture production data from the 2020 and 2021 construction season surveys. The information requested in the survey is detailed in Appendix A and summarized in Table A1, Section 2. State-level data are reported in Appendix B.

From 2020 to 2021, the estimated total amount of asphalt mixture produced in the United States increased from 407.8 million tons to 432.4 million tons, an increase of 6 percent.

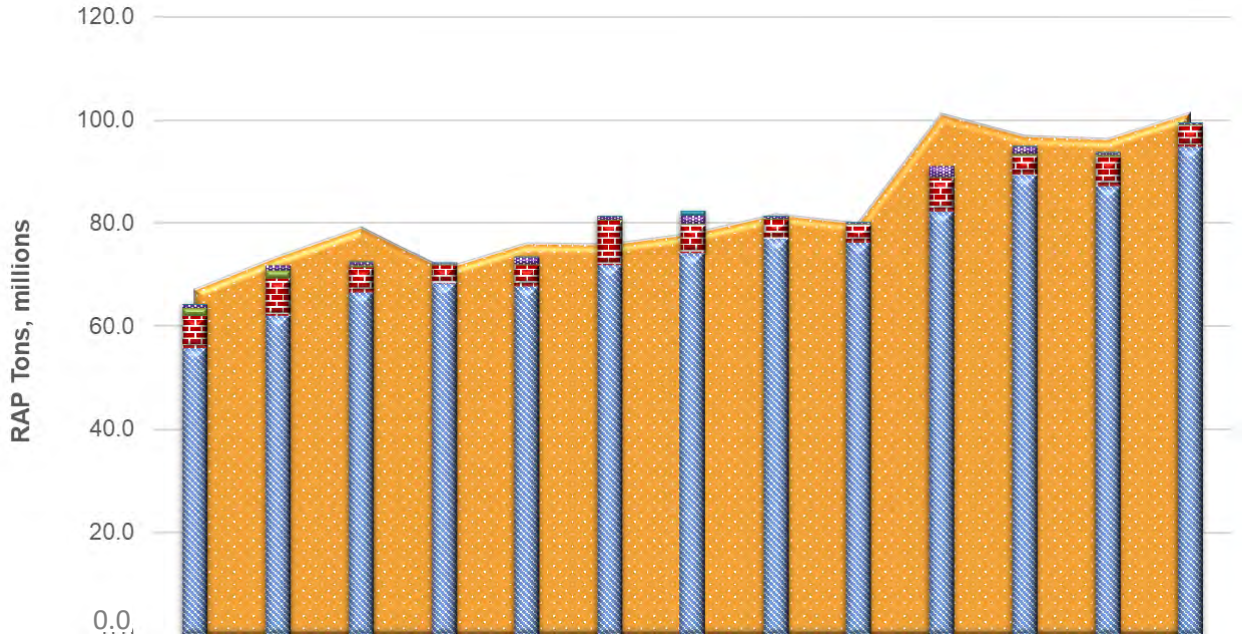
Asphalt pavement mixture producers' customers can be divided into two broad sectors: the private sector (Commercial & Residential) and the public sector (DOT or Other Agency). The "Other Agency" sector includes asphalt pavement mixtures produced for public works agencies; toll authorities; and city, county, and tribal transportation agencies, as well as the U.S. military and Federal agencies, such as the Federal Aviation Administration, National Park Service, and U.S. Forest Service.

As seen in Figure 2, increases and decreases in total tonnage production estimates by sector have varied from year to year. Compared to the 2020 construction season, 2021 asphalt mixture tonnage produced for the DOT sector increased 5.5 percent, mixture production for the Other Agency sector increased by 6.4 percent, and the Commercial and Residential sector increased 6.4 percent from 2020 to 2021.

Reclaimed Asphalt Pavement

Table 4 includes the National summary of RAP data from the 2020 and 2021 construction season surveys. The information requested in the survey is detailed in Appendix A and summarized in Table A1, Section 2. State-level data is reported in Appendix B. Figure 3 is a visual representation of the estimated total tons of RAP used in asphalt mixtures, aggregate, cold-mix asphalt, and other uses, as well as the amount landfilled, from the 2009 to 2021 construction season surveys. The overwhelming majority of RAP is used in hot-mix asphalt (HMA) or warm-mix asphalt (WMA) mixtures, which is the most optimal use of RAP.

From the 2020 to 2021 construction season, the amount of RAP used in HMA/WMA increased from 87.0 million to 94.6 million tons. The average percent RAP used in asphalt mixtures increased to 21.9 percent in 2021 from 21.3 percent in 2020. For 2021, 100 percent of companies responding to the survey reported using RAP. This was a slight increase from the 99 percent of companies reporting using RAP in 2020, and matching the 100 percent of companies reporting using RAP in the 2013 and 2014 construction season surveys.



RAP	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Accepted	67.2	73.5	79.1	71.3	76.1	75.8	78.0	81.8	79.9	101.1	97.0	96.3	101.3
Landfilled	0.1	0.0	0.3	0.2	0.1	0.2	1.0	0.1	0.0	0.0	0.1	0.2	0.1
Used in Other	0.7	0.8	0.7	0.2	1.5	0.6	1.6	0.4	0.2	2.0	1.4	0.3	0.2
Used in Cold Mix	1.5	1.6	0.2	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.1
Used in Aggregate	6.2	7.3	4.9	3.6	4.0	8.5	5.5	3.7	3.4	6.4	3.8	5.8	4.2
Used in HMA/WMA	56.0	62.1	66.7	68.3	67.8	71.9	74.2	76.9	76.2	82.2	89.2	87.0	94.6

Figure 3: Comparison of Tons of RAP Accepted and Tons of RAP Used or Landfilled (Million Tons), 2009–2021

Placement of RAP in construction and demolition landfills is rare. Since the beginning of the survey in 2009, the average amount of RAP landfilled is less than 167,000 tons per year. In 2021, 86,656 tons, about 0.09 percent, of RAP was landfilled. The amount of RAP accepted during the 2021 construction season saved about 61.5 million cubic yards of landfill space.

RAP Use by Sector

Figure 4 shows the total estimated tons of RAP used in each sector. These values were calculated using the average percentages of RAP reported by producers for each sector and adjusted to account for differences between reported RAP tonnage and tons calculated from the percentage by sector.

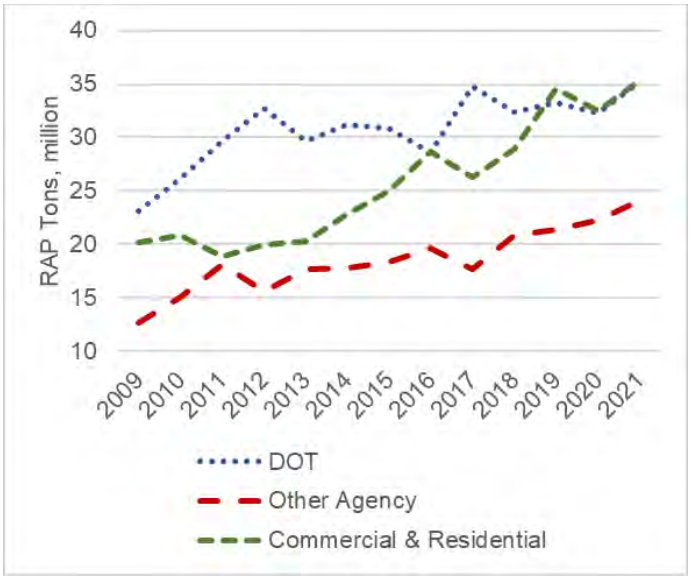


Figure 4: RAP Use by Sector (Million Tons)

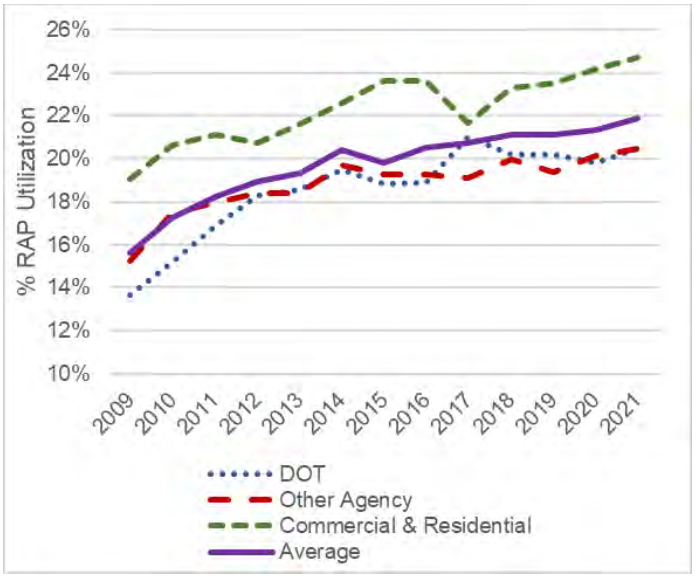


Figure 5: Average Percent RAP Used by Sector

Figure 5 shows the average percentage of RAP used by each sector and overall across all asphalt pavement mixtures. In 2021, the average percent RAP used by all sectors increased to a new high of 21.9 percent. Previously, the average percent RAP had seen steady growth from 2009 to 2014 before plateauing around 20 percent through 2017. The percent of RAP used in each sector during 2021 increased slightly, remaining steady with the utilization percentages from 2020 and 2019.

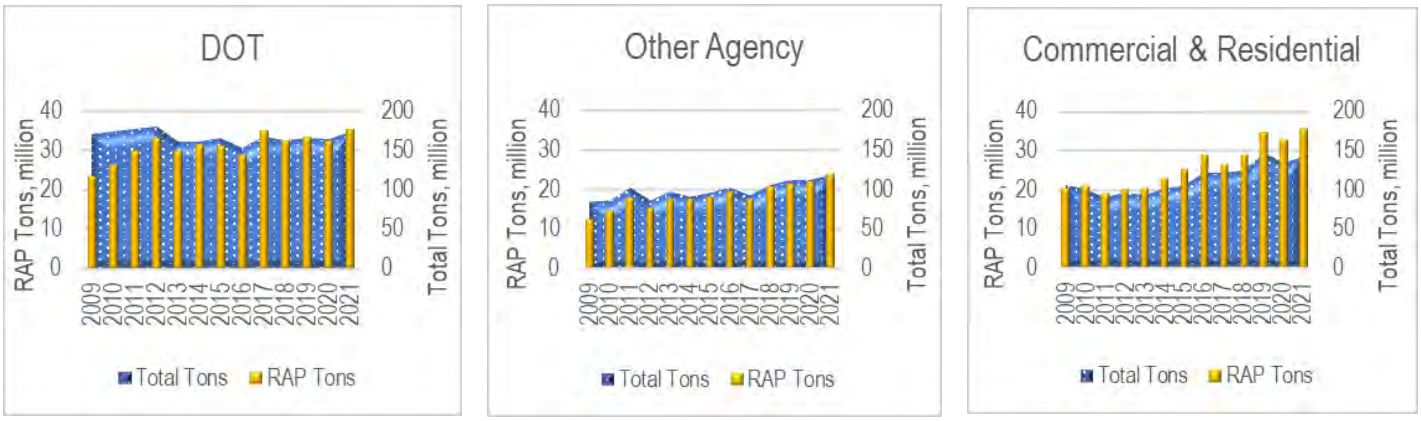


Figure 6: RAP Tons and Total Mixture Tons Comparison (Million Tons)

Since the 2012 construction season, the tonnage of RAP used by each sector has generally moved up or down with the total tonnage used by the sector, which is shown in Figure 6. For the 2021 construction season, the tons of RAP used increased in all sectors. The changes in RAP tonnage were a result of changes in mix tonnages for each sector, and the sectors had slight increases in their percent utilization, which resulted in the National average percentage of RAP used increasing from 21.3 percent in 2020 to 21.9 percent 2021 season.

RAP Use in Each State

Table 5 and Figure 7 show the average percentage of RAP used in HMA/WMA mixtures in each State by construction season based on reported RAP tons used in HMA/WMA mixtures and total reported tonnage. It should be noted that the accuracy of data for individual States varies depending on the number of responses received from producers in each State and the total number of tons accounted for in the responses.

Figure 8 revisualizes the Table 5 data, showing the number of States with producers reporting average RAP percentages used at the various ranges by construction season from 2009 to 2021. The number of States with producers reporting average RAP percentages 20 percent or greater has increased significantly, rising from 10 States in 2009 to 27 States in 2014; 29 States in 2016, decreasing to 24 States in 2017, 30 States in 2018, and peaking at 31 States in 2019, falling back to 26 States in 2020, and then reaching 32 States in 2021. The number of States with producers reporting RAP percentages less than 15 percent has decreased from 23 States in 2009 to just two States in 2014 and then remained relatively steady at 10 or 11 States in 2015 through 2017, before dropping to six States in 2018, five States in 2019, slightly increasing to seven States in 2020, and then returning to 5 States in 2021.

Table 5: Average Estimated Percentage of RAP Used in Each State, 2017–2021

State	Average RAP Percent					State	Average RAP Percent				
	2017	2018	2019	2020	2021		2017	2018	2019	2020	2021
Alabama	24%	26%	25%	24%	26%	Montana	*	*	*	*	*
Alaska	*	*	*	*	*	Nebraska	19%	26%	*	20%	*
American Samoa	*	*	*	NCR	NCR	Nevada	12%	*	*	17%	19%
Arizona	10%	12%	9%	7%	4%	New Hampshire	22%	18%	*	17%	22%
Arkansas	11%	12%	13%	14%	11%	New Jersey	19%	18%	20%	17%	20%
California	18%	16%	16%	15%	17%	New Mexico	21%	19%	*	*	*
Colorado	24%	20%	20%	19%	22%	New York	16%	17%	17%	18%	14%
Connecticut	18%	15%	21%	*	*	North Carolina	18%	26%	24%	31%	31%
Delaware	*	*	NCR	*	*	North Dakota	12%	*	*	*	*
Dist. of Columbia	*	*	*	*	*	No. Mariana Isl.	NCR	NCR	NCR	NCR	NCR
Florida	35%	27%	31%	34%	32%	Ohio	28%	28%	32%	28%	27%
Georgia	23%	25%	*	28%	31%	Oklahoma	15%	17%	19%	19%	19%
Guam	NCR	NCR	NCR	NCR	NCR	Oregon	18%	27%	26%	27%	29%
Hawaii	20%	23%	19%	*	18%	Pennsylvania	15%	16%	13%	20%	21%
Idaho	27%	27%	24%	26%	26%	Puerto Rico	NCR	NCR	NCR	NCR	NCR
Illinois	25%	28%	23%	26%	28%	Rhode Island	*	*	*	*	*
Indiana	22%	24%	21%	24%	23%	South Carolina	21%	22%	22%	21%	27%
Iowa	11%	18%	19%	17%	17%	South Dakota	*	NCR	NCR	*	*
Kansas	19%	21%	*	26%	25%	Tennessee	23%	18%	24%	19%	20%
Kentucky	24%	16%	16%	18%	17%	Texas	15%	17%	16%	19%	18%
Louisiana	21%	22%	22%	17%	21%	U.S. Virgin Islands	NCR	*	NCR	NCR	NCR
Maine	20%	*	*	17%	18%	Utah	22%	27%	28%	26%	29%
Maryland	23%	26%	30%	28%	28%	Vermont	*	*	*	*	*
Massachusetts	16%	16%	16%	15%	18%	Virginia	32%	28%	28%	31%	31%
Michigan	28%	28%	29%	26%	27%	Washington	20%	24%	23%	24%	23%
Minnesota	20%	25%	24%	24%	22%	West Virginia	18%	20%	18%	17%	16%
Mississippi	18%	20%	23%	20%	20%	Wisconsin	16%	17%	21%	21%	21%
Missouri	23%	21%	27%	23%	27%	Wyoming	12%	*	*	*	*

NCR No Company Responding	* < 3 Companies Reporting	0–9%	10–14%	15–19%	20–29%	≥ 30%

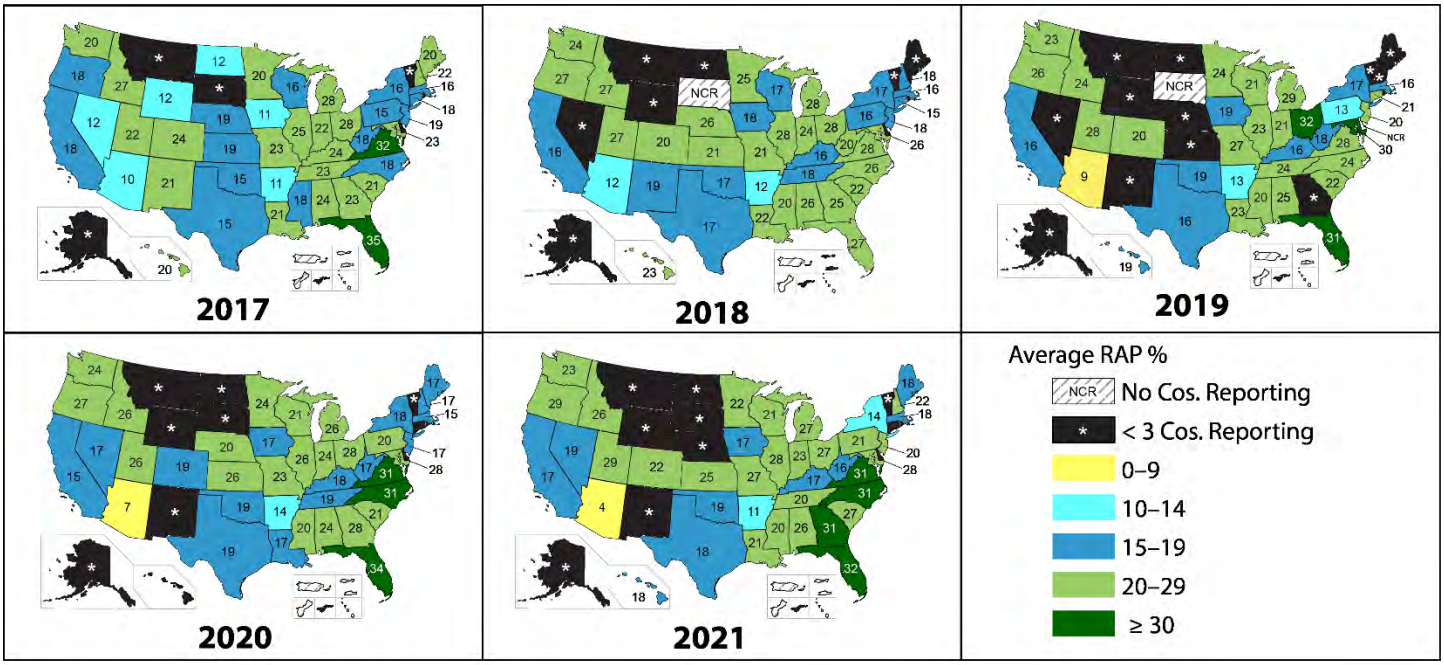


Figure 7: Estimated Average Percentage of RAP Used in Each State, 2017–2021

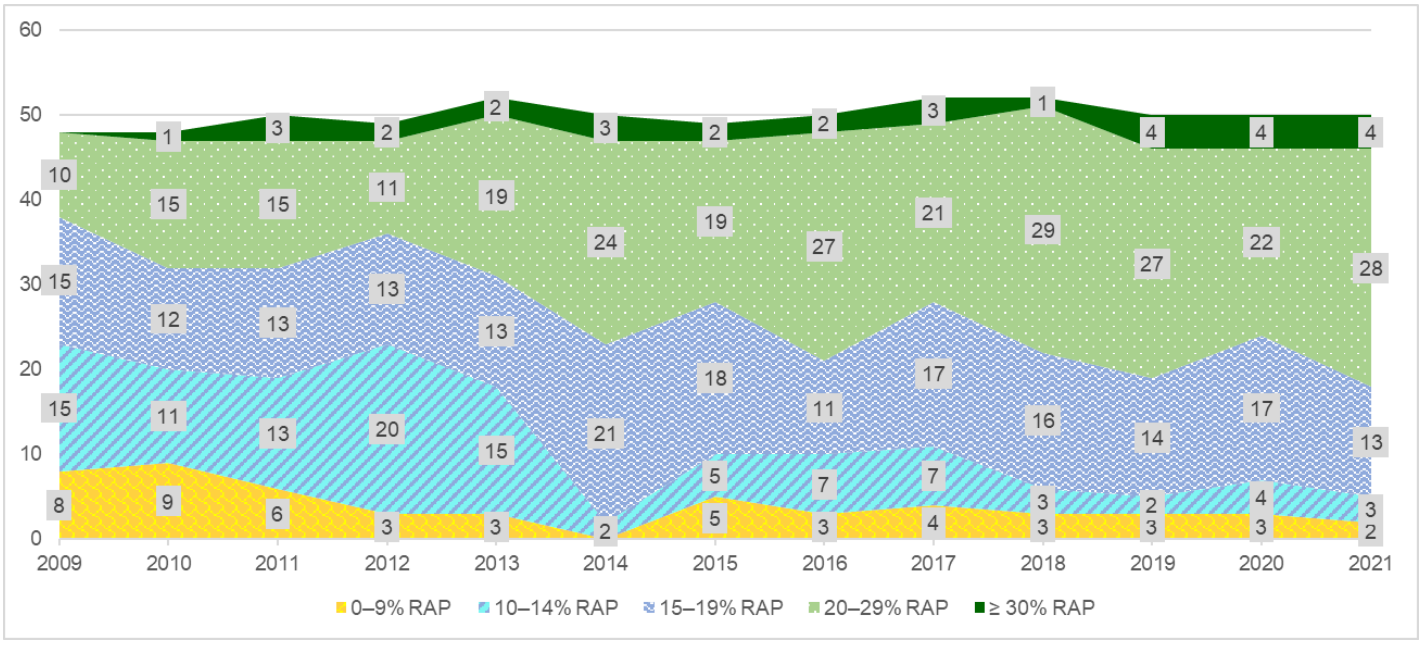


Figure 8: Number of States at Different Average Percentage of RAP Used in HMA/WMA Mixtures, 2009–2021

RAP Stockpiles

During the 2021 construction season, an estimated 101.3 million tons of RAP was accepted by asphalt mixture producers, and 99.1 million tons of RAP was used across all purposes during the year. In 2021, as in 2020, 2019, 2018, and 2016, more RAP was received than was utilized, indicating an increase in producer inventory. By comparison, in 2012, 2014, and 2015, more RAP was used than was received, indicating producers were drawing upon stockpiled RAP. In 2017, RAP acceptance and use were about equal. In 2021, the estimated amount of RAP stockpiled nationwide increased to 137.5 million tons, a 2 percent increase from the 135.3 million tons of RAP stockpiled at the end of the 2020 construction season. The increase in stockpiled inventory is inline with the difference in the amount of RAP used and accepted. For 2021, 97.7 percent of producers reported having stockpiled RAP, up from 97.1 percent of producers in 2020. The reported RAP stockpiled represents about 1.4 years of inventory at 2021 utilization levels. Table 6 shows the reported and estimated amount of RAP stockpiled in each State at the end of the 2021 construction season. To calculate the estimated values, reported tons of RAP stockpiled were divided by the ratio of total reported tons of mixture produced to estimate tons of mixture produced. The total tonnage row in Table 6 includes stockpiled tonnages from States with fewer than three producers reporting.

Table 6: Reported Tons of RAP Stockpiled

State	Reported Tons Stockpiled (Million)		Estimated Tons Stockpiled (Million)		State	Reported Tons Stockpiled (Million)		Estimated Tons Stockpiled (Million)	
	2020	2021	2020	2021		2020	2021	2020	2021
Alabama	0.76	1.26	2.13	1.62	Montana	*	*	*	*
Alaska	*	*	*	*	Nebraska	0.12	*	0.90	*
American Samoa	NCR	NCR	NCR	NCR	Nevada	0.12	0.29	0.34	0.65
Arizona	0.58	1.02	1.02	2.13	New Hampshire	0.32	0.29	0.46	0.30
Arkansas	0.45	0.32	0.93	0.70	New Jersey	2.30	9.59	4.69	26.89
California	2.08	0.99	4.33	2.92	New Mexico	*	*	*	*
Colorado	0.86	0.31	1.57	0.77	New York	0.89	0.65	2.79	2.65
Connecticut	*	*	*	*	North Carolina	5.60	4.39	6.78	6.35
Delaware	*	*	*	*	North Dakota	*	*	*	*
District of Columbia	*	*	*	*	No. Mariana Isl.	NCR	NCR	NCR	NCR
Florida	3.62	2.04	5.43	5.21	Ohio	3.81	3.09	5.81	3.46
Georgia	3.31	2.25	6.07	5.03	Oklahoma	1.20	1.21	1.61	1.21
Guam	NCR	NCR	NCR	NCR	Oregon	0.94	0.69	2.34	2.05
Hawaii	*	0.13	*	0.24	Pennsylvania	0.85	0.88	2.57	3.09
Idaho	0.65	0.59	1.56	1.39	Puerto Rico	NCR	NCR	NCR	NCR
Illinois	2.00	1.16	3.43	2.39	Rhode Island	*	*	*	*
Indiana	2.35	3.71	4.07	5.05	South Carolina	1.42	1.68	3.11	1.68
Iowa	0.53	0.65	1.45	1.83	South Dakota	*	*	*	*
Kansas	0.79	0.80	1.15	1.31	Tennessee	1.85	1.67	4.32	2.59
Kentucky	0.58	0.96	1.36	1.98	Texas	0.99	2.14	6.69	11.00
Louisiana	0.05	0.21	0.35	1.02	U.S. Virgin Islands	NCR	NCR	NCR	NCR
Maine	0.37	0.29	0.37	0.29	Utah	0.46	1.08	0.52	1.45
Maryland	2.65	2.27	3.63	4.49	Vermont	*	*	*	*
Massachusetts	0.69	0.92	1.56	3.67	Virginia	2.56	2.37	3.68	4.15
Michigan	14.98	2.28	22.17	3.77	Washington	1.15	0.73	1.22	0.98
Minnesota	3.96	1.88	6.62	2.00	West Virginia	0.34	0.36	4.33	0.65
Mississippi	0.61	0.46	0.63	0.74	Wisconsin	2.14	2.70	2.67	4.00
Missouri	0.42	0.46	1.76	1.47	Wyoming	*	*	*	*
					Total†	71.48	59.82	135.30	137.45

NCR No Companies Responding for the State to the Survey
* Fewer than 3 Companies Reporting
† Includes Values from States with Fewer than 3 Companies Reporting

RAP Fractionation

Table 7 shows the average percentage of RAP fractionated into two or more sizes in each State, as reported by survey participants. **These results are representative *only* of the survey participants and do not completely reflect practices in a given State.** This also helps explain the State-level variability from year to year. Producers and SAPAs were not questioned about State specifications regarding fractionation and recycled material content.

Previous reports have shown that fractionation of RAP does not correlate to increased RAP utilization percentages. This holds true for the 2021 data, with an example being Texas, which reports 60 percent of RAP being fractionated and averaging under 18 percent RAP in mixtures, while Florida reported only 4 percent of RAP being fractionated but averaged over 31 percent RAP in mixtures.

Table 7: Reported Percentage of RAP Fractionated, in Each State, 2020–2021

State	% Fractionated		State	% Fractionated		State	% Fractionated	
	2020	2021		2020	2021		2020	2021
Alabama	35%	35%	Kentucky	50%	34%	Ohio	19%	20%
Alaska	*	*	Louisiana	25%	50%	Oklahoma	70%	44%
American Samoa	NCR	NCR	Maine	17%	0%	Oregon	8%	1%
Arizona	13%	0%	Maryland	5%	7%	Pennsylvania	23%	28%
Arkansas	37%	16%	Massachusetts	7%	0%	Puerto Rico	NCR	NCR
California	41%	19%	Michigan	22%	28%	Rhode Island	*	*
Colorado	26%	34%	Minnesota	12%	11%	South Carolina	27%	63%
Connecticut	*	*	Mississippi	17%	5%	South Dakota	*	*
Delaware	*	*	Missouri	16%	24%	Tennessee	34%	63%
Dist. of Columbia	*	*	Montana	*	*	Texas	45%	60%
Florida	14%	4%	Nebraska	0%	*	U.S. Virgin Isl.	NCR	NCR
Georgia	8%	33%	Nevada	0%	0%	Utah	8%	15%
Guam	NCR	NCR	New Hampshire	0%	0%	Vermont	*	*
Hawaii	*	33%	New Jersey	25%	33%	Virginia	31%	29%
Idaho	1%	20%	New Mexico	*	*	Washington	18%	27%
Illinois	58%	61%	New York	17%	0%	West Virginia	0%	0%
Indiana	61%	51%	North Carolina	42%	27%	Wisconsin	24%	5%
Iowa	5%	0%	North Dakota	*	*	Wyoming	*	*
Kansas	35%	32%	No. Mariana Isl.	NCR	NCR			
					Average, Where Used[†]		26%	25%

NCR No Companies Responding for the State to the Survey

* Fewer than 3 Companies Reporting

[†] Includes Values from States with Fewer than 3 Companies Reporting

RAP Recycling Agent Use

Table 8 shows the percentage of reported tons of RAP-containing mixtures produced using softer binder or recycling agents in each State. **These results are representative *only* of the survey participants and do not completely reflect practices in a given State.** While there is no strong relationship between the amount of RAP mixtures using softer binder or recycling agents and percentage of RAP used by the State, it should be noted that of the 32 States using 20 percent or more RAP, 28 of them report using softer binders and or recycling agents in a percentage of their RAP mixtures and four of these States reported no use of softer binders or recycling agents in RAP mixtures.

Table 8: Percentage of RAP Mixes Using Softer Binder and/or Recycling Agents in Each State, 2021

State	Softer Binder	Recyc. Agent	State	Softer Binder	Recyc. Agent	State	Softer Binder	Recyc. Agent
Alabama	0%	17%	Kentucky	3%	0%	Ohio	30%	3%
Alaska	*	*	Louisiana	8%	0%	Oklahoma	16%	10%
American Samoa	NCR	NCR	Maine	0%	5%	Oregon	6%	0%
Arizona	40%	33%	Maryland	33%	8%	Pennsylvania	11%	6%
Arkansas	11%	0%	Massachusetts	0%	0%	Puerto Rico	NCR	NCR
California	0%	32%	Michigan	22%	1%	Rhode Island	*	*
Colorado	5%	0%	Minnesota	20%	2%	South Carolina	10%	2%
Connecticut	*	*	Mississippi	0%	0%	South Dakota	*	*
Delaware	*	*	Missouri	60%	0%	Tennessee	17%	11%
Dist. of Columbia	*	*	Montana	*	*	Texas	40%	0%
Florida	62%	13%	Nebraska	*	*	U.S. Virgin Isl.	NCR	NCR
Georgia	0%	0%	Nevada	0%	1%	Utah	63%	20%
Guam	NCR	NCR	New Hampshire	0%	0%	Vermont	*	*
Hawaii	0%	0%	New Jersey	4%	30%	Virginia	22%	1%
Idaho	87%	0%	New Mexico	*	*	Washington	25%	3%
Illinois	63%	9%	New York	0%	2%	West Virginia	0%	0%
Indiana	1%	0%	North Carolina	32%	0%	Wisconsin	20%	1%
Iowa	0%	0%	North Dakota	*	*	Wyoming	*	*
Kansas	88%	4%	No. Mariana Isl.	NCR	NCR			
						Average, When Used†	22%	5%

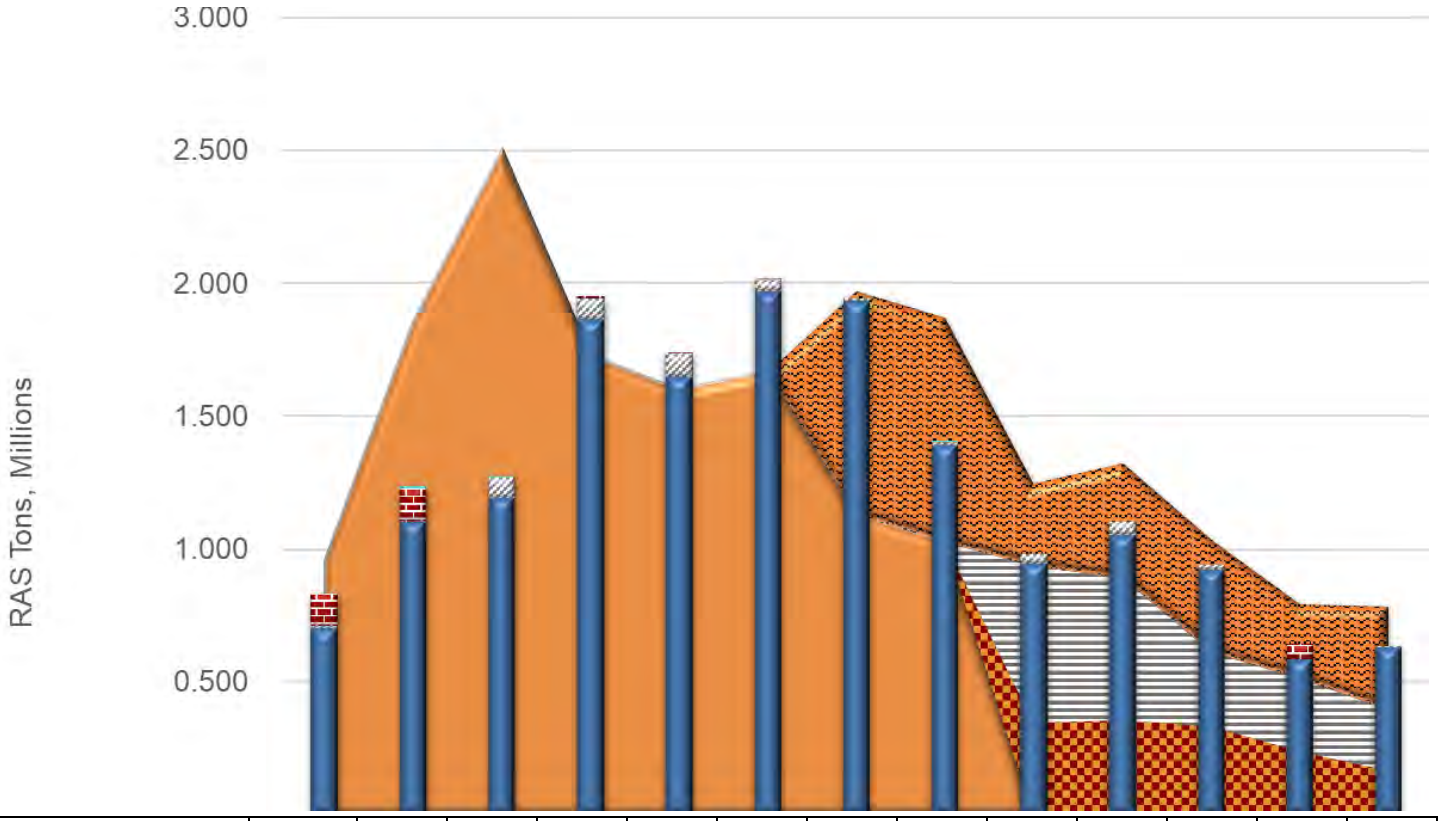
NCR No Companies Responding for the State to the Survey
* Fewer than 3 Companies Reporting
† Includes Values from States with Fewer than 3 Companies Reporting

Although the data is highly dependent upon the companies responding to the survey each year, the average percentage of RAP mixtures incorporating softer binders was 22 percent during the 2021 construction season, which is down from 23 percent in the 2020 survey. The percentage of RAP mixtures incorporating recycling agents has fluctuated year to year with 5 percent in 2021, 6 percent in 2020, 4 percent in 2019, 4 percent in 2018, 4 percent in 2017, 7 percent in 2016, and 3 percent in 2015.

Reclaimed Asphalt Shingles

Table 4 includes the National summary of RAS data from the 2020 and 2021 construction season surveys. The information requested in the survey is detailed in Appendix A and summarized in Table A1, Section 3. State-level data is reported in Appendix B. Producers and SAPAs were not asked about allowable RAS limits or binder replacement requirements for their States. Figure 9 is a visual representation of the estimated total tons of RAS used in asphalt mixtures, aggregate, cold-mix asphalt, and other uses, as well as the amount landfilled, from the 2009 to 2021 construction season surveys.

During the 2021 construction season, the total estimated amount of unprocessed and processed shingles received by producers was 780,000 tons, which is more than combined amount of RAS used in asphalt mixtures (630,000 tons) and in aggregate applications (3,000 tons) for the year. This is a 2 percent decrease from the 792,000 total tons of RAS from all sources accepted during the 2020 construction season. The use of 630,000 tons of RAS in asphalt pavement mixtures during 2021 is a 7 percent increase from the 586,000 tons used in 2020.



RAS	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Processed Shingles Accepted	-	-	-	-	-	-	0.842	0.846	0.311	0.430	0.423	0.278	0.385
PCAS	-	-	-	-	-	-	-	-	0.591	0.534	0.277	0.277	0.230
MWAS	-	-	-	-	-	-	-	-	0.344	0.356	0.334	0.237	0.165
Unprocessed Shingles Accepted	0.957	1.851	2.500	1.724	1.599	1.684	1.129	1.027	-	-	-	-	-
Landfilled	-	0.007	0.000	-	-	-	-	0.005	-	-	-	-	-
Used in Other	0.123	0.125	-	0.012	0.005	0.006	-	-	-	-	-	0.055	-
Used in Cold Mix	-	-	-	-	-	-	-	-	-	-	-	-	-
Used in Aggregate	0.006	0.003	0.074	0.073	0.082	0.043	0.009	0.009	0.036	0.050	0.018	-	0.003
Used in HMA/WMA	0.702	1.100	1.192	1.863	1.647	1.964	1.931	1.390	0.944	1.053	0.921	0.586	0.630

Figure 9: Comparison of Tons of RAS Accepted and Tons of RAS Used or Landfilled (Million Tons), 2009–2021. Processed RAS Acceptance First Tracked in 2015

As shown in Figure 9, from the 2012 to 2014 construction seasons, producers reported using RAS in greater quantities than they accepted. When this trend was first noticed, producers were contacted to confirm the reported values. All producers contacted indicated they either had RAS stockpiled or were purchasing RAS from shingle processors. To capture the volume of processed shingles accepted by producers, the 2015 survey began asking producers "How many tons of processed shingles were accepted/delivered to your facilities in the State?" Beginning with the 2017 construction season survey producers were asked to report the tons of unprocessed PCAS, unprocessed MWAS, and processed RAS accepted separately.

As seen in Table 4, there was a significant (30 percent) decrease in the acceptance of MWAS and a 17 percent decrease in the acceptance of PCAS in 2021 compared to 2020, but that was countered by a significant (38 percent) increase in the acceptance of processed shingles, leading to a slight (2 percent) decrease in the total amount of RAS accepted during the 2021 construction season. The total estimated amount of unprocessed shingles accepted by producers declined 23 percent from 514,000 tons in 2020 to 395,000 tons in 2021. Acceptance of processed shingles increased 38 percent during the same time period, from 278,000 tons in 2020 to 385,000 tons in 2021.

No RAS accepted by producers was reported as landfilled during the 2021 construction season. By accepting 395,00 tons of unprocessed RAS from both PCAS and MWAS sources, asphalt mixture producers saved about 240,000 cubic yards of landfill space.

According to the United States Environmental Protection Agency (U.S. EPA, 2020), about 15.1 million tons of waste shingles are generated annually. Therefore, asphalt mixture producers in 2021 diverted about 2.6 percent of the total available supply of waste shingles from landfills.

The number of companies using RAS increased from 57 in 2020 to 65 during the 2021 construction season. The percentage of producers reporting use of RAS decreased from 21 percent of respondents in 2020 to 25 percent in 2021.

RAS Use by Sector

Figure 10 shows the total estimated amount of RAS used in each of the three sectors of the paving market. These values were calculated using the average percentages of RAS reported by producers for the sectors and adjusted to account for differences between reported RAS tonnage and tons calculated from the percentage by sector. There was a decrease in the tons of RAS used by the DOT sector and an increase in the tons of RAS used by the Other Agency and Commercial and Residential sectors from the 2020 to 2021 construction season. The Other Agency and Commercial and Residential sectors also saw increases in percentage of RAS use from 2020 to 2021, while the DOT sector percentage did not change from 2020 to 2021.

Figure 11 shows the average percentage of RAS used by each sector and overall across all asphalt pavement mixtures. These values were calculated using the average percentages of RAS reported for the different sectors and adjusted to account for differences between reported RAS tonnage and tons calculated from the percentage by sector. Although previous years' surveys saw relatively steady growth across all sectors from 2009 to 2014 with some year-to-year variation, there was a leveling of total RAS use from 2012 to 2015 until a notable decline began

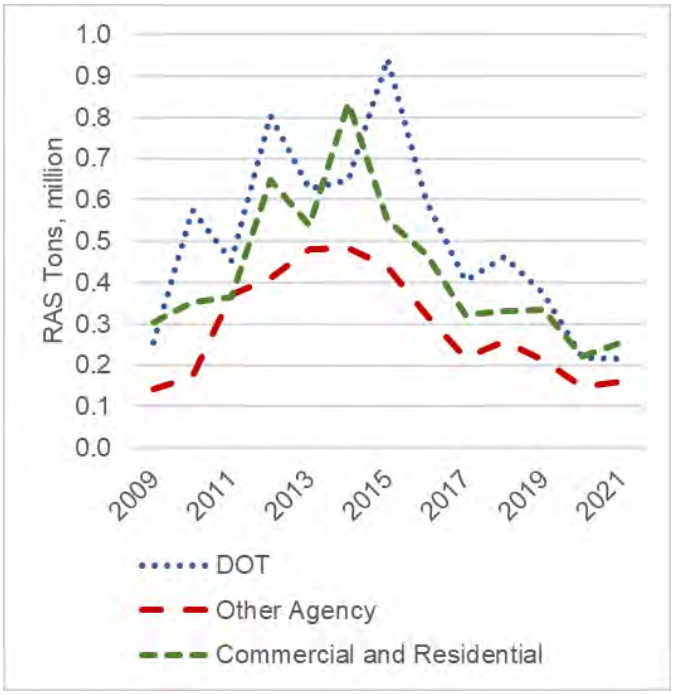


Figure 10: Estimated RAS Use by Sector (Million Tons)

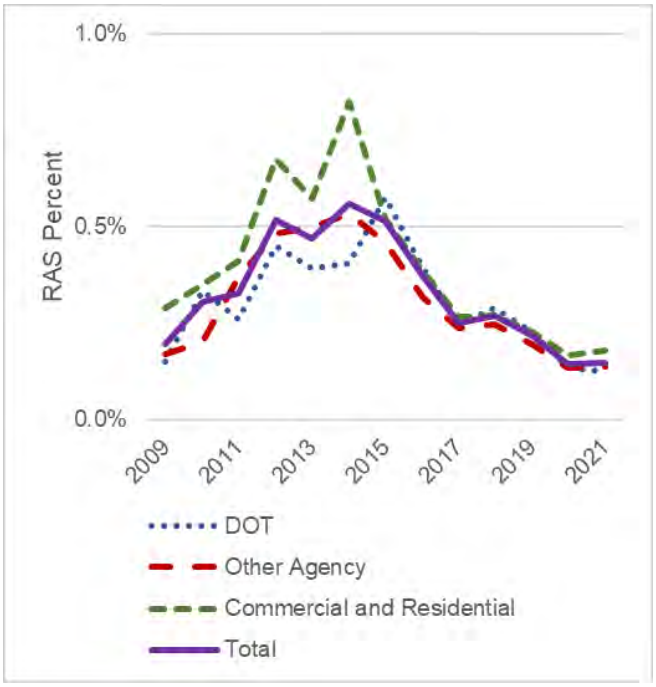


Figure 11: Average Percent RAS Used by Sector

in 2016 and continued into the 2021 season. The average percentage RAS peaked at 0.56 percent in 2012 and started declining from 0.54 percent in 2014 to 0.15 percent in the 2021 construction season.

In 2021, producers and SAPAs were asked which sectors allow RAS to be included in asphalt mixtures. Responses came from 50 States, and this information is summarized in Table 9. In cases where conflicting answers were provided, a middle ground was assumed with SAPA responses being given greater weight regarding the public sectors' RAS use and contractors' responses being given greater weight for the private sector. Most respondents reported that RAS is allowed in at least some mixtures and sectors. According to responses from producers and SAPAs, 29 DOTs reportedly allow RAS in some asphalt pavement mixtures, and three other DOTs allow it in all mixtures. RAS use is allowed in some Other Agency sector mixtures in 36 States, with no additional States allowing RAS in all mixtures for that sector. Similarly, RAS is allowed in at least some Commercial & Residential sector mixtures in 45 States. There were no reports of States allowing RAS in all mixtures for all sectors, while five States — Alaska, Hawaii, Louisiana, North Dakota, and Wyoming — reportedly do not allow the use of RAS in mixtures for any sector.

Table 9: Sectors Allowing RAS, 2021

State	RAS Allowed In?			State	RAS Allowed In?		
	DOT Mixtures	Other Agency Mixtures	Commercial & Residential Mixtures		DOT Mixtures	Other Agency Mixtures	Commercial & Residential Mixtures
Alabama	Some	Some	Some	Montana	Some	None	Some
Alaska	None	None	None	Nebraska	Some	Some	Some
American Samoa	NCR	NCR	NCR	Nevada	None	None	Some
Arizona	None	None	Some	New Hampshire	None	Some	Some
Arkansas	Some	Some	Some	New Jersey	Some	None	Some
California	Some	Some	Some	New Mexico	Some	Some	Some
Colorado	Some	Some	Some	New York	Some	Some	Some
Connecticut	Some	Some	Some	North Carolina	Some	Some	Some
Delaware	Some	Some	Some	North Dakota	None	None	None
District of Columbia	DNA	DNA	DNA	No. Mariana Isl.	NCR	NCR	NCR
Florida	None	Some	Some	Ohio	Some	Some	Some
Georgia	None	Some	Some	Oklahoma	None	Some	Some
Guam	NCR	NCR	NCR	Oregon	Some	Some	Some
Hawaii	None	None	None	Pennsylvania	Some	Some	Some
Idaho	None	Some	Some	Puerto Rico	NCR	NCR	NCR
Illinois	All	Some	Some	Rhode Island	None	None	Some
Indiana	All	Some	Some	South Carolina	Some	Some	Some
Iowa	Some	Some	Some	South Dakota	None	Some	Some
Kansas	Some	Some	Some	Tennessee	Some	Some	Some
Kentucky	Some	Some	Some	Texas	Some	Some	Some
Louisiana	None	None	None	U.S. Virgin Islands	NCR	NCR	NCR
Maine	Some	None	Some	Utah	None	None	Some
Maryland	Some	Some	Some	Vermont	None	Some	Some
Massachusetts	Some	Some	Some	Virginia	Some	Some	Some
Michigan	Some	Some	Some	Washington	Some	Some	Some
Minnesota	All	Some	Some	West Virginia	None	None	Some
Mississippi	None	None	Some	Wisconsin	Some	Some	Some
Missouri	Some	Some	Some	Wyoming	None	None	None

DNA Did Not Answer
NCR No Companies Responding

Table 10: States With Reported RAS Use, 2011–2021

State	RAS Used?										
	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Alabama	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes
Alaska	No	No	No	No	No	No	No	No	No	No	No
American Samoa	NCR	NCR	NCR	NCR	NCR	NCR	No	No	No	NCR	NCR
Arizona	No	No	No	No	No	No	No	No	No	No	No
Arkansas	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
California	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Colorado	Yes	Yes	No	Yes	Yes	Yes	Yes	No	No	No	No
Connecticut	No	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Delaware	NCR	Yes	Yes	Yes	Yes	Yes	No	No	NCR	Yes	No
District of Columbia	NCR	NCR	No	NCR	NCR	NCR	No	No	No	No	No
Florida	No	No	Yes	Yes	Yes	No	No	Yes	No	No	No
Georgia	Yes	Yes	Yes	No	No	Yes	No	No	No	No	No
Guam	NCR	NCR	NCR	NCR	NCR	NCR	NCR	NCR	NCR	NCR	NCR
Hawaii	No	No	No	No	No	No	No	No	No	No	No
Idaho	No	No	No	No	No	No	No	No	No	No	No
Illinois	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Indiana	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Iowa	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	No
Kansas	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Kentucky	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Louisiana	No	No	Yes	No	No	Yes	No	No	No	No	No
Maine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Maryland	Yes	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes
Massachusetts	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Michigan	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Minnesota	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Mississippi	Yes	Yes	Yes	Yes	Yes	Yes	No	No	No	No	No
Missouri	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Montana	No	No	No	No	No	No	No	No	No	No	No
Nebraska	No	Yes	Yes	No	No	Yes	No	No	No	No	No
Nevada	No	No	No	No	No	Yes	Yes	No	No	No	No
New Hampshire	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
New Jersey	No	No	Yes	No	No	No	No	No	Yes	No	No
New Mexico	No	NCR	No	No	NCR	Yes	Yes	No	No	No	No
New York	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No	No
North Carolina	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
North Dakota	No	NCR	No	No	No	No	No	No	No	No	No
N. Mariana Islands	NCR	NCR	NCR	NCR	NCR	NCR	NCR	NCR	NCR	NCR	NCR
Ohio	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oklahoma	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Oregon	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pennsylvania	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Puerto Rico	No	No	No	NCR	No	NCR	NCR	NCR	NCR	NCR	NCR
Rhode Island	No	No	No	No	No	No	No	No	No	No	No
South Carolina	Yes	No	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes
South Dakota	Yes	Yes	Yes	Yes	NCR	Yes	No	NCR	NCR	No	No
Tennessee	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes
Texas	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
U.S. Virgin Islands	NCR	NCR	NCR	NCR	NCR	NCR	NCR	No	NCR	NCR	NCR
Utah	No	No	No	No	No	No	No	No	No	No	No
Vermont	No	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No
Virginia	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	No	No	No
Washington	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
West Virginia	No	No	No	No	No	No	No	No	No	No	No
Wisconsin	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Wyoming	No	No	Yes	No	No	Yes	No	No	No	No	No

NCR	= No Companies Responding
Yes	= RAS Use Reported
No	= No RAS Use Reported

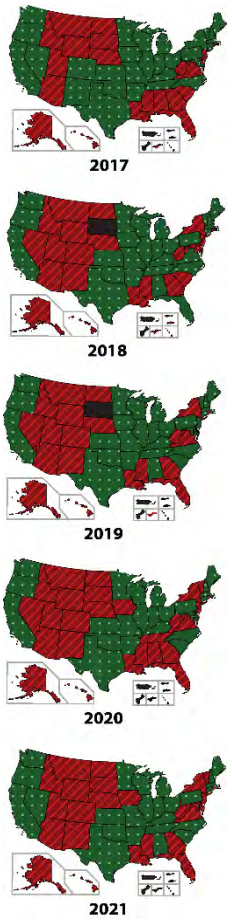


Figure 12: States with Companies Reporting RAS Use by Construction Season, 2017–2021

RAS Use in Each State

Table 10 shows States where asphalt pavement mixture producers reported using RAS in 2011 through 2021, and Figure 12 shows States where producers reported using RAS from 2017 through 2021. Red indicates a State where RAS use was not reported for that construction season. The number of States where producers reported using RAS increased annually from 22 in 2009 to 38 in 2013, but decreased to 34 in 2014, 32 in 2015, 29 in 2017, 27 in 2018, 28 in 2019, and 24 in 2020. During the 2021 construction season, asphalt mixture producers in 25 States report RAS use. Iowa producers for the second time since the beginning of the survey reported no RAS use, while still reporting that RAS is allowed in some mixtures for all sectors.

RAS Stockpiles

In 2021, 97 percent of the 65 producers using RAS reported having inventories of stockpiled RAS, compared to 93 percent of the 57 producers using RAS in 2020. Some 1.132 million tons of RAS was reported as stockpiled at year-end 2021, a (11.0 percent) decrease from the 1.272 million tons of RAS in stockpiles at the end of 2020. The reported RAS stockpiled represents about 1.8 years of inventory at 2021 utilization levels.

Table 11: Reported Tons of RAS Stockpiled, 2020–2021

State	Reported Tons Stockpiled (Thousands)		Estimated Tons Stockpiled (Thousands)		State	Reported Tons Stockpiled (Thousands)		Estimated Tons Stockpiled (Thousands)	
	2020	2021	2020	2021		2020	2021	2020	2021
Alabama	0.0	5.0	0.0	6.4	Montana	*	*	*	*
Alaska	*	*	*	*	Nebraska	0.0	*	0.0	*
American Samoa	NCR	NCR	NCR	NCR	Nevada	0.0	0.0	0.0	0.0
Arizona	0.0	0.0	0.0	0.0	New Hampshire	0.0	0.0	0.0	0.0
Arkansas	4.7	17.2	9.6	37.5	New Jersey	0.0	0.0	0.0	0.0
California	0.0	0.0	0.0	0.0	New Mexico	*	*	*	*
Colorado	0.0	0.0	0.0	0.0	New York	0.0	0.0	0.0	0.0
Connecticut	*	*	*	*	North Carolina	179.0	173.5	217.0	251.0
Delaware	*	*	*	*	North Dakota	*	*	*	*
District of Columbia	*	*	*	*	No. Mariana Isl.	NCR	NCR	NCR	NCR
Florida	0.0	0.0	0.0	0.0	Ohio	29.0	24.0	44.2	26.9
Georgia	0.0	14.5	0.0	32.5	Oklahoma	75.2	22.2	100.9	22.2
Guam	NCR	NCR	NCR	NCR	Oregon	27.5	9.1	68.1	27.2
Hawaii	*	0.0	*	0.0	Pennsylvania	62.1	5.0	187.4	17.6
Idaho	0.0	0.0	0.0	0.0	Puerto Rico	NCR	NCR	NCR	NCR
Illinois	14.1	3.5	24.2	7.2	Rhode Island	*	*	*	*
Indiana	15.9	2.3	27.6	3.1	South Carolina	15.0	24.5	32.8	24.5
Iowa	0.0	5.0	0.0	14.1	South Dakota	*	*	*	*
Kansas	5.5	7.4	8.0	12.2	Tennessee	0.0	2.6	0.0	4.0
Kentucky	10.5	50.4	24.7	104.3	Texas	23.5	39.9	158.2	205.0
Louisiana	0.0	0.0	0.0	0.0	U.S. Virgin Isl.	NCR	NCR	NCR	NCR
Maine	0.1	0.3	0.1	0.3	Utah	0.0	0.0	0.0	0.0
Maryland	13.0	5.6	17.8	11.1	Vermont	*	*	*	*
Massachusetts	60.9	12.5	136.5	49.7	Virginia	0.0	5.0	0.0	8.8
Michigan	1.0	2.0	1.5	3.3	Washington	9.5	6.5	10.1	8.7
Minnesota	1.0	18.5	1.7	19.7	West Virginia	0.0	0.0	0.0	0.0
Mississippi	0.0	0.0	0.0	0.0	Wisconsin	50.7	46.5	63.4	68.9
Missouri	4.0	7.5	17.0	24.0	Wyoming	*	*	*	*
					Total†	605.3	518.6	1272.3	1132.2

NCR No Companies Responding
* Fewer than 3 Companies Reporting
† Includes Values from States with Fewer than 3 Companies Reporting

Table 11 shows the reported and estimated amount of RAS stockpiled in each State at the end of the 2020 and 2021 construction seasons. To calculate the estimated values, reported tons of RAS stockpiled were divided by the ratio of total reported tons of mix produced to estimated tons of mix produced. The total tonnage row in Table 11 includes stockpiled tonnages from States with fewer than three producers reporting.

RAS Recycling Agent Use

Table 12 shows the percentage of reported tons of RAS-containing mixtures produced using softer binder or recycling agents in each State. **These results are representative *only* of the survey participants and do not completely reflect practices in a given State.** Similar to the RAP, there does not appear to be a relationship between the amount of RAS mixtures using softer binder and/or recycling agents and percentage of RAS used by the State.

Table 12: Percentage of RAS Mixtures Using Softer Binder and/or Recycling Agents in Each State, 2021

State	Softer Binder	Recyc. Agent	State	Softer Binder	Recyc. Agent	State	Softer Binder	Recyc. Agent
Alabama	0%	100%	Kentucky	50%	0%	Ohio	100%	0%
Alaska	*	*	Louisiana	0%	0%	Oklahoma	75%	50%
American Samoa	NCR	NCR	Maine	0%	0%	Oregon	0%	0%
Arizona	0%	0%	Maryland	80%	0%	Pennsylvania	25%	0%
Arkansas	0%	0%	Massachusetts	0%	0%	Puerto Rico	NCR	NCR
California	50%	0%	Michigan	100%	0%	Rhode Island	*	*
Colorado	0%	0%	Minnesota	33%	0%	South Carolina	0%	10%
Connecticut	*	*	Mississippi	0%	0%	South Dakota	*	*
Delaware	*	*	Missouri	100%	0%	Tennessee	0%	45%
Dist. of Columbia	*	*	Montana	*	*	Texas	25%	0%
Florida	0%	0%	Nebraska	*	*	U.S. Virgin Isl.	NCR	NCR
Georgia	0%	0%	Nevada	0%	0%	Utah	0%	0%
Guam	NCR	NCR	New Hampshire	0%	0%	Vermont	*	*
Hawaii	0%	0%	New Jersey	0%	0%	Virginia	0%	0%
Idaho	0%	0%	New Mexico	*	*	Washington	73%	11%
Illinois	54%	4%	New York	0%	0%	West Virginia	0%	0%
Indiana	0%	0%	North Carolina	88%	0%	Wisconsin	100%	9%
Iowa	0%	0%	North Dakota	*	*	Wyoming	*	*
Kansas	100%	0%	No. Mariana Isl.	NCR	NCR			
						Average, When Used†	29%	4%

NCR No Companies Responding for the State to the Survey

* Fewer than 3 Companies Reporting

† Includes Values from States with Fewer than 3 Companies Reporting

Although the data is highly dependent upon the companies responding to the survey each year, in States where RAS is reportedly used, the average percentage of RAS mixtures incorporating softer binders was 29 percent during the 2021 construction season, while the percentage of RAS mixtures incorporating recycling agents was at 4 percent. In 2020, producers reported a lower average percentage (24 percent) of RAS mixtures incorporating softer binders and a higher percentage (8 percent) of RAS mixtures incorporating recycling agents, as compared to the 2021 construction season.

The Importance of Engineering Recycled Asphalt Mixtures for Quality

For more than three decades, two guiding principles of asphalt recycling have been: asphalt mixtures containing recycled materials should 1) meet the same requirements as asphalt mixtures with all virgin materials, and 2) perform equal to or better than asphalt mixtures with all virgin materials. This is at the heart of the "Three E's of Recycling," which State that recycled materials should provide Environmental, Economic, and Engineering benefits.

Quality recycled mixtures have been successfully designed and produced for many years. When successfully engineered, designed, produced, and constructed, the proof is in performance. A recent study comparing the performance of recycled versus virgin mixtures based on Long-Term Pavement Performance (LTPP) data from 16 U.S. States and two Canadian provinces shows that overlays containing at least 30 percent RAP performed equal to overlays using virgin mixtures (Carvalho et al., 2010; West et al., 2011). At the National Center for Asphalt Technology (NCAT) Test Track, test sections containing 50 percent RAP using Superpave mixture design procedures for each layer outperformed companion test sections with all virgin materials in all pavement performance measures.

However, as the amount of recycled materials in asphalt pavement mixtures increase, additional considerations for material handling, engineering, mixture design, quality, and performance testing become more important. In particular, RAP and RAS should be tested and classified to determine the amount, properties, and quality of available asphalt binder. These values have an impact on pavement performance and are important to assess when developing a high recycled content mixture design. In some cases, it may be necessary to make use of recycling agents or a softer asphalt binder to ensure the final mixture design delivers the desired level of product performance. FHWA has an extensive list of considerations and practices for responsible use of RAP in asphalt mixtures that span categorically from mixture design and mixture acceptance to mixture production and QC/QA (FHWA, 2021).

For more information about processing and using reclaimed asphalt pavement and recycled asphalt shingles, consult the NAPA publication *Best Practices for RAP and RAS Management* (Quality Improvement Series 129).

Cost Savings from RAP and RAS

The use of RAP and RAS both reduce the need for virgin materials, conserving valuable asphalt and aggregates. Beyond the environmental benefits of resource preservation, the use of RAP and RAS can help lower initial material costs for road construction, allowing road owners to achieve more roadway maintenance and construction activities within limited budgets. Table 13 summarizes the individual and cumulative savings from the use of RAP and RAS in asphalt mixtures realized during the 2021 construction season. In total, the use of RAP and RAS saved more than $3.5 billion during the 2021 construction season compared to the use of all virgin materials. This is $547 million more than in 2020 due to increases in asphalt binder prices (Table 14) and increased total asphalt mixture tonnages in 2021. Some State highway agencies also calculate cost savings associated with recycled materials use for their agencies, one example provided by the Illinois Department of Transportation valued the recycled materials used in Illinois highways at more than $65 million during the 2020 construction season (IDOT, 2021).

Table 13: Material Savings, 2020–2021

Material	Material Quantity, Million Tons		% Agg.	% AC	Aggregate Cost Savings, $ Billion		Asphalt Binder Cost Savings, $ Billion		Total Cost Savings, $ Billion	
	2020	2021			2020	2021	2020	2021	2020	2021
RAP	87.0	94.6	95	5	$0.894	$1.035	$2.061	$2.457	$2.955	$3.492
RAS	0.586	0.630	50*	20	$0.003	$0.004	$0.056	$0.065	$0.059	$0.069
Total					$0.898	$1.038	$2.116	$2.522	$3.014	$3.561

* Includes granules and mineral filler

The estimated savings shown in Table 13 were based on the cost factors shown in Table 14. Asphalt binder prices were estimated based upon an average of publicly available 2021 asphalt price indexes for 37 States (see Figure 13). The estimated savings do not account for possible changes in mixture costs incurred while using RAP and RAS beyond what is shown, with some examples being that measures such as incorporating a recycling agent or utilizing a different grade asphalt binder may have been necessary to achieve the mixture performance desired or to meet the specification requirements for a project. The average price of unmodified asphalts from these States for 2021 was about $490.65 per ton, up from the 2020 average price of $442.35. Five of the States (Alabama, Connecticut, Florida, Louisiana, and Virginia) also provide price indexes for modified asphalts. The average modified asphalt prices from these States for 2021 was $614.01 per ton, up from $572.89 in 2020. Assuming 10 percent of asphalt mixtures use modified asphalt binders, the 2021 average price of asphalt binders used in asphalt mixtures was $519.45 per ton, up 9.7 percent from 2020.

Most asphalt mixtures today use crushed stone as the primary aggregate, but they often include a small percentage of natural sand. The U.S. Geological Survey (USGS) reports the average price of Stone (Crushed) increased to $11.79 per ton and Sand and Gravel (Construction) increased to $8.98 per ton for 2021 (USGS, 2022). Assuming the average asphalt pavement mixture contains 10 percent natural sand and 90 percent crushed stone, the average price of aggregate in an asphalt mixture was $11.51 per ton for the 2021 construction season, up 6.4 percent from 2020.

Table 14: Material Cost Factors, 2018–2021

Material		% of Market	Cost/Ton			
			2018	2019	2020	2021
Asphalt	Unmodified	90	$468.93	$500.38	$442.35	$490.65
	Modified	10	$595.98	$646.63	$572.89	$614.01
	Weighted Average		$481.90	$532.46	$473.72	$519.45
Aggregate	Crushed Stone	90	$10.76	$11.12	$11.06	$11.79
	Sand and Gravel	10	$8.29	$8.01	$8.70	$8.98
	Weighted Average		$10.51	$10.81	$10.82	$11.51

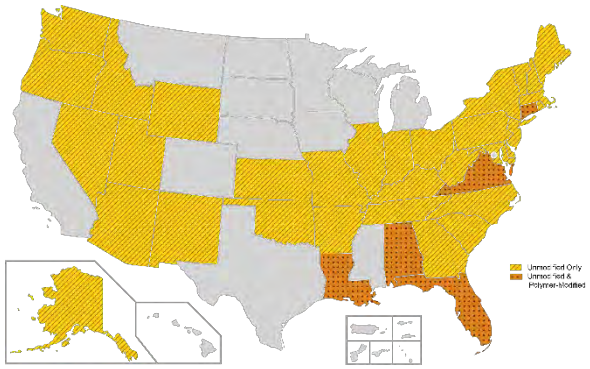


Figure 13: States with Publicly Available Asphalt Price Indexes, 2021

Minor additional cost savings, not calculated for this report, are associated with the use of RAS in stone-matrix asphalt and other specialty asphalt mixtures where shingle fibers may potentially replace mineral or cellulose fibers.

Additional cost savings are realized by diverting RAP and RAS from landfills. The National average gate fee for disposing of mixed construction and demolition (C&D) material in landfills is relatively close to the National average for municipal solid waste (MSW) landfill disposal (Tolaymat et al., 2017). Based upon a 2021 National average for MSW landfill gate fees of $54.03 per ton, not sending more than 95 million tons of RAP and RAS to landfills (nearly 62 million cubic yards of material) saved more than $5.1 billion dollars in gate fees, up from $4.7 billion in 2020, due in part to a 0.6 percent increase in MSW gate fees from 2020 to 2021 (Boxman & Staley, 2022).

Warm-Mix Asphalt Technology

Table 4 includes the National summary of WMA technology usage data from the 2020 and 2021 construction season surveys. The information requested in the survey is detailed in Appendix A and summarized in Table A1, Section 4. State-level data is reported in Appendix B. Producers were also asked about the different WMA technologies used.

Prior to the 2018 construction season, producers were asked to report primarily the use of WMA technologies to reduce production temperatures by at least 10°F from typical mixture production temperatures. However, because of potential compaction, antistrip, and workability benefits, the use of WMA technologies at HMA temperatures is common. To better understand the use of WMA technologies at different temperatures, the 2018, 2019, 2020, and 2021 construction season surveys asked additional questions to ensure disaggregation of WMA technology use at different temperatures. The results indicate that prior survey reports have better captured the use of WMA technologies than the use of WMA technologies at reduced temperature. Table 4 and this section report both aggregated data on the use of WMA technologies and disaggregated data on its use by mixture temperature where possible.

The percentage of companies reporting the use of WMA technologies saw rapid increases from the 2009 to 2011 construction seasons, but has gradually declined from 78 percent of respondents in 2015 to 62 percent of respondents in the 2019, rebounding to 67 percent in 2020 and returning to 62 percent for the 2021 construction season, as shown in Figure 15. Increases in tonnage with WMA technologies as a percent of total tonnage plateaued between 2013 and 2016, as seen in Figure 16. The 2021 construction season had a 5 percent decrease in the production of asphalt with WMA technologies to 177.9 million tons, 41.1 percent of total asphalt pavement tonnage. A total of 161 companies, 62 percent of respondents, reported using WMA technologies during the 2021 construction season.

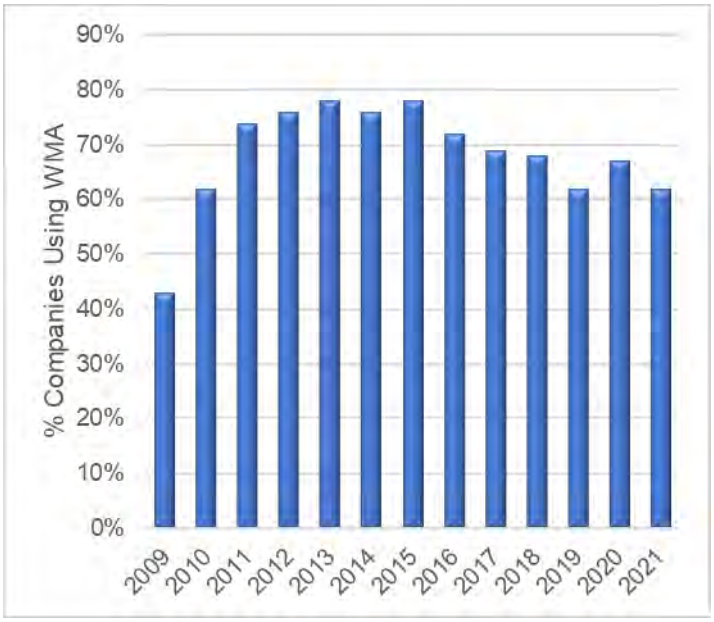


Figure 14: Percent of Companies Using WMA Technologies

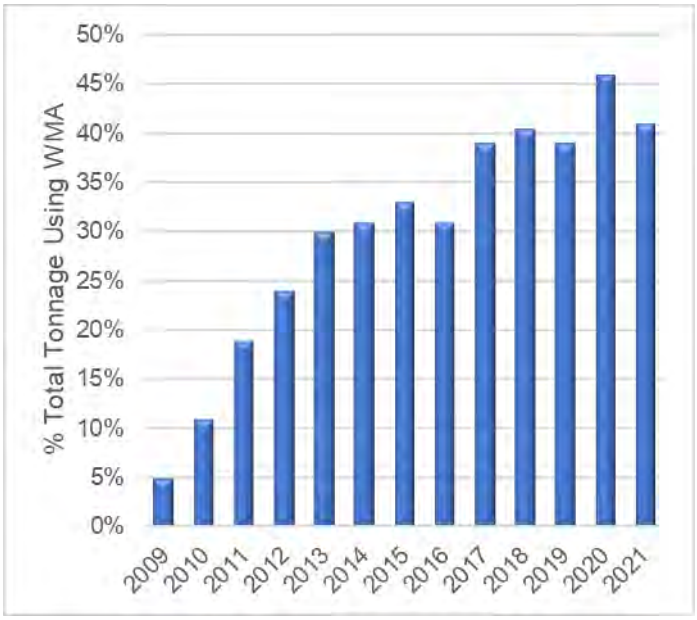
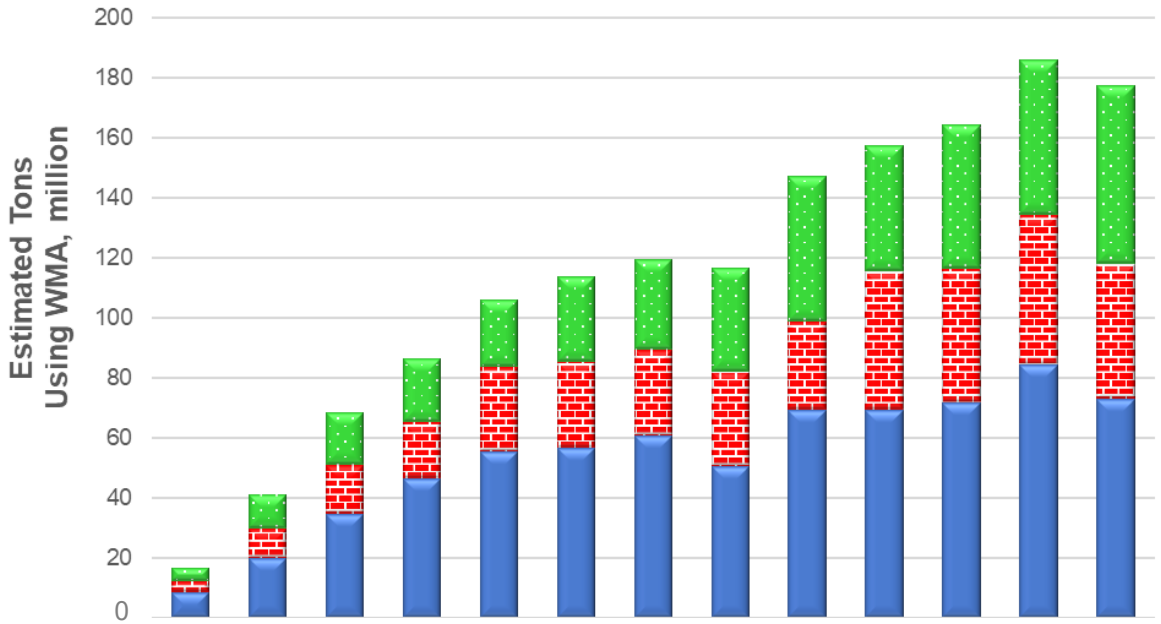


Figure 15: Percent Total Tonnage Produced Using WMA Technologies

WMA Technology Use by Sector

Figure 16 shows a steady increase in the number of tons of mixture produced using WMA technologies for each customer sector from 2011 to 2013, with use showing minor changes for the 2014 though 2016 construction seasons. In 2017, however, WMA technology use grew substantially due to notable increases in mixtures produced for the DOT and Commercial & Residential sectors. During 2018, growth in tonnage produced with WMA technologies was driven largely by a 58 percent increase in tons produced for the Other Agency sector. In 2019, tons produced with WMA technology in the Other Agency sector was down, while the DOT and the Commercial & Residential sectors were up from the 2018 construction season. Mix tonnages increased in the Commercial and Residential sector and fell in the DOT and Other Agency sectors during the 2021 construction season when compared to 2020. All in all, during the 2021 construction season, 42.5 percent of all DOT sector tonnage, 38.3 percent of Other Agency sector tonnage, and 41.8 percent of Commercial & Residential sector tonnage was produced using WMA technologies.



Sector	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Commercial & Residential	4.6	11.3	17.8	21.4	22.8	28.5	30.4	34.6	48.4	42.0	48.0	52.0	59.8
Other Agency	3.6	9.8	16.3	18.9	27.9	28.4	28.5	31.5	29.4	46.5	44.8	49.9	45.1
DOT	8.6	20	34.6	46.4	55.7	56.9	60.9	50.7	69.6	69.3	71.7	84.5	73.0

Figure 16: Estimated Tons (Millions) Produced With WMA Technologies by Sector, 2009–2021

WMA Technology Use in Each State

Figure 17 shows the estimated percentage of total tons produced as WMA in each State. The National trend from 2009 through 2021 shows increasing tons of asphalt mixture produced with WMA technologies; however, a degree of fluctuation year-to-year is seen at the State-level. The accuracy of data for individual States varies noticeably depending on the number of responses received from each State and the total number of tons represented by the respondents each year.

From 2020 to 2021, 11 States saw an increase of 10 percentage points or more in WMA production, while 17 States had a decrease of 10 percentage points or more. Four States — California, Delaware, North Dakota, and Wyoming — had an increase of 30 percentage points or more in mixture production with WMA technologies. Ten States — Arkansas, Colorado, Georgia, Kentucky, Nebraska, New Hampshire, New York, South Carolina, South Dakota, and West Virginia — had a decrease of 30 percentage points or more in mixture production with WMA technologies.

Mixture production with WMA technologies made up over half of the total asphalt mixture production in 18 States during 2021, six of these States — Connecticut, Louisiana, Mississippi, Pennsylvania, Virginia, and Wyoming — reported WMA as 75 percent or more of total production in 2021. Georgia, Hawaii, Montana, Rhode Island, and South Dakota had no reported asphalt production with WMA technologies in 2021.

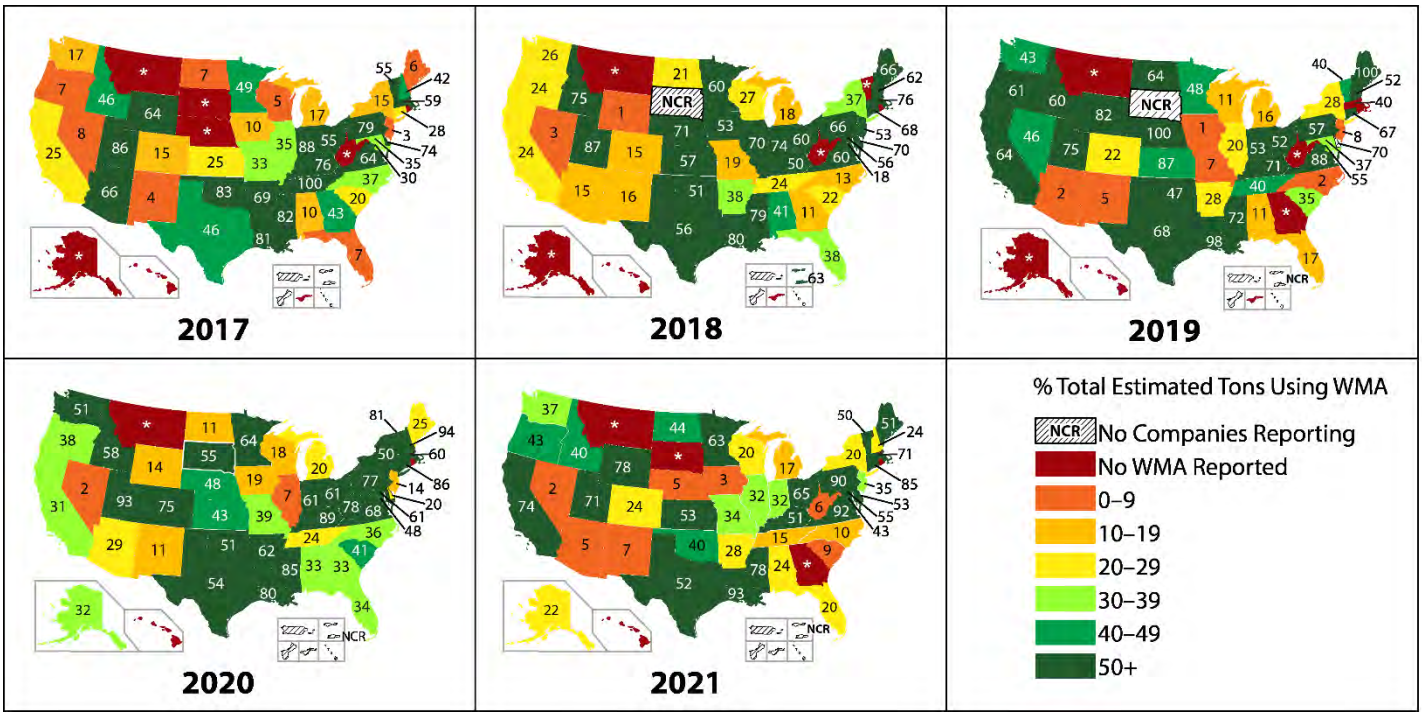


Figure 17: Estimated Percent of Total Production Using WMA Technologies in Each State, 2017–2021

WMA Technologies

As Table 15 and Figure 18 show, production plant foaming for the first time was not the most commonly used WMA production technology, being used for around 38 percent of the WMA produced in 2021. This is a decrease of about 23 percent from the 2020 season. The use of chemical additive technologies at 60.2 percent represents a 29 percent increase for the 2021 construction season compared to 2020. Organic additives represented 1.8 percent of the market. Additive foaming was 0.3 percent of the market during 2021. The percentage of WMA produced with additive technologies has grown significantly since 2011 when they made up less than 5 percent of the WMA technologies used, and plant-based foaming has seen a general decrease over the same time period.

Table 15: Percent Production of WMA Technologies, 2009–2021

WMA Technology	% Production												
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Production Plant Foaming %	83.0%	92.0%	95.4%	88.3%	87.0%	84.5%	72.0%	76.9%	64.7%	63.2%	51.0%	49.2%	37.7%
Additive Foaming %	2.0%	1.0%	0.2%	2.0%	0.3%	0.0%	2.1%	0.0%	0.0%	0.7%	0.0%	2.6%	0.3%
Chemical Additive %	15.0%	6.0%	4.1%	9.4%	12.1%	15.0%	25.2%	21.1%	32.2%	34.3%	48.3%	46.6%	60.2%
Organic Additive %	0.3%	1.0%	0.3%	0.2%	0.0%	0.5%	0.7%	1.9%	3.1%	1.8%	0.7%	1.6%	1.8%

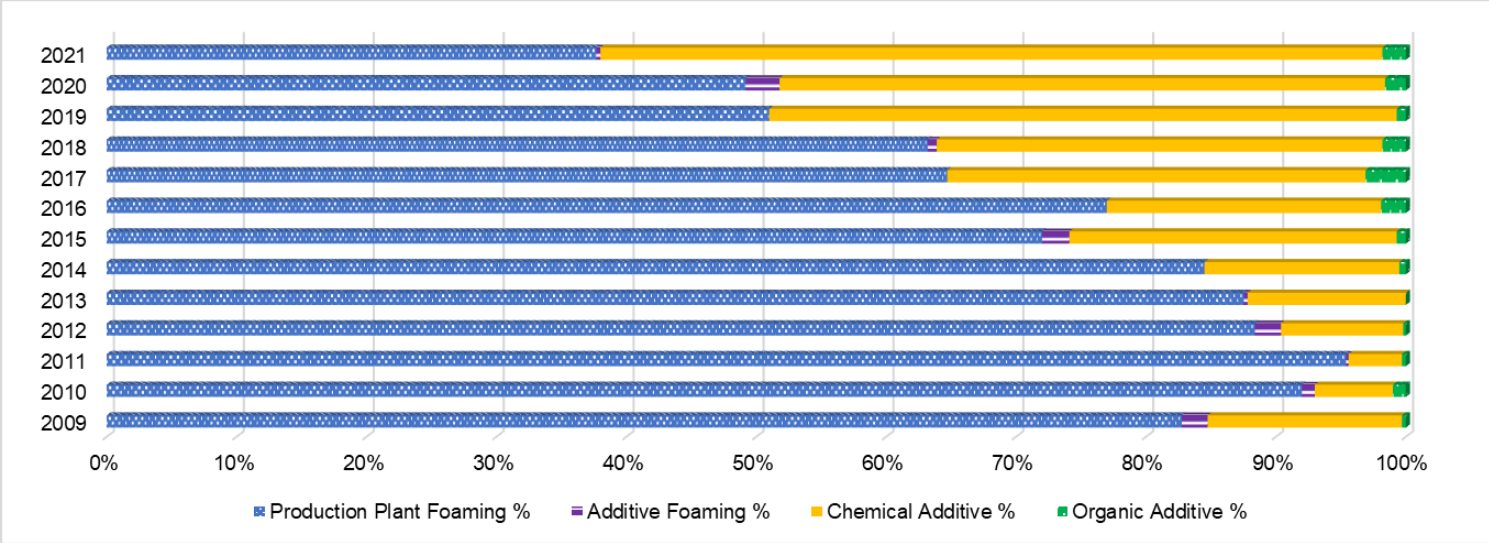


Figure 18: WMA Technologies Used as Percent of WMA Production, 2009–2021

Use of WMA Technologies at Different Temperatures

WMA additives can have compaction, workability, antistrip, and other benefits that encourage their use even when a reduction in production temperature is not sought or achieved by the producer. For this reason, producers were asked to report use of WMA technologies for asphalt production both at traditional HMA temperatures and at reduced temperatures. About 52.8 percent (94.1 million tons) of total tonnage produced using WMA technologies was produced with a temperature reduction of at least 10°F.

Of the respondents, 161 producers in 45 States, reported using WMA technologies. Of these, 87 producers reporting using WMA technologies at both reduced and HMA temperatures; 44 producers used WMA technologies only at reduced temperatures; and 30 producers reported using WMA technologies only at HMA temperatures.

Table 16 shows the percentage of reported tons produced using each WMA technologies at both reduced temperatures and at traditional HMA temperatures, along with the total tonnages produced with WMA technologies. While there is variation in the utilization of different WMA technologies at different production temperatures, producers reporting the use of WMA technologies at all temperatures typically did not report varying the technology by temperature. Therefore, much of the difference between the Reduced Temperatures and the HMA Temperatures columns in Table 16 is attributable to the technologies employed by producers that only utilize WMA technologies at either reduced temperatures or HMA temperatures.

The National average of the responses is shown in Table 16.

Table 16: WMA Technologies Utilization Detail, 2021

WMA Technology	% of Market		
	Reduced Temperatures	HMA Temperatures	At All Temperatures
Chemical Additive	59.6%	60.8%	60.2%
Plant Foaming	39.0%	36.3%	37.7%
Additive Foaming	0.3%	0.2%	0.3%
Organic Additive	1.1%	2.7%	1.8%
2021 Tons (Millions)	94.1	83.8	177.9

Energy and Greenhouse Gas Emission Benefits from WMA and RAP

Energy and greenhouse gas (GHG) emission benefits from use of WMA technologies to produce asphalt mixtures at reduced temperature and use of RAP in new asphalt mixtures are estimated to provide contextual information regarding the potential environmental impacts of these industry practices. These calculations are based on publicly available data and emission factors published by government agencies, industry, and non-governmental organizations. A detailed overview of the methodology and assumptions used to calculate energy and GHG emission benefits is provided in Appendix C. GHG emissions are reported in million metric tonne (MMT) of CO_2-equivalent (CO_2e) emissions to be consistent with emission inventories published by the U.S. EPA and other government agencies.

Energy and GHG Emission Benefits from Production of WMA at Reduced Temperature

New for 2021, mix producers were asked to indicate the average temperature reduction achieved for WMA produced at reduced temperature. The distribution of temperature reductions achieved is provided in Table 17. The majority (83.7%) of mix produced at reduced temperature using WMA technology was in the range of 10° - 30° F. Smaller percentages (13.9% and 2.4%) of mix was produced at reduced temperature in the range of 31° - 50° F and 51° or more, respectively. The weighted average temperature reduction achieved among asphalt mix produced at reduced temperature was 23.5° F. The weighted average temperature reduction achieved among all asphalt mix produced was 5.1° F.

Table 17: Temperature Distribution of WMA Production at Reduced Temperature

WMA Technology at Reduced Temperature	10° – 30° F	31° – 50° F	51° F or more
Percentage	83.7%	13.9%	2.4%
Total (Tons, Millions)	78.7	13.1	2.3

The estimated reductions in energy consumption and GHG emissions for WMA produced at reduced temperature are provided in Table 18. The net GHG emissions reduction associated with mix production at reduced temperature using WMA technology was 0.080 MMT CO_2e in 2021, equivalent to the annual emissions of 17,000 passenger vehicles. The data in Table 18 are rounded to two significant digits to reflect the underlying uncertainties and approximate level of precision for these estimates.

Table 18: Estimated GHG emissions reduction for all WMA technology produced at reduced temperature in 2021

Weighted Average Temperature Reduction[1]	Mix Production Energy Reduction (trillion Btu)	Mix Production GHG Emissions Reduction (MMT CO_2e)	Upstream GHG Emissions Burden (MMT CO_2e)	Net GHG Emissions Reduction (MMT CO_2e)	Equivalent Number of Passenger Vehicles[2]
23.5°F	2.2	0.16	0.080	0.080	17,000

[1] The weighted average temperature reduction for mix produced at reduced temperature using WMA technology is 23.5°F.

[2] Assumes that each vehicle emits 4.6 tonne CO_2e/yr (U.S. EPA, 2018).

The emissions reduction calculations for this year's report improve upon the methodology from previous years in three ways:

- The survey now provides an estimate of actual temperature reductions achieved during mix production, rather than relying on conservative and optimistic scenarios.
- Estimates are provided for the types and relative amounts of burner fuel consumed by asphalt plants rather than assuming the use of natural gas as a burner fuel across the board.
- The updated cradle-to-combusted emission factors are consistent with the GHG Emissions Inventory for Asphalt Mixture Production in the U.S. (Shacat et al., 2022) and environmental product declarations (EPDs) for asphalt mixtures.

A detailed discussion of the assumptions and calculations for the energy and GHG emissions reductions is provided in Appendix C.

GHG Emission Benefits from Use of RAP

A summary of GHG emission reductions and burdens from use of RAP is provided in Table 19. Net reduction of GHG emissions from use of RAP in new asphalt mixtures in 2021 is estimated to be 2.6 MMT CO_2e, equivalent to the annual emissions from approximately 574,000 passenger vehicles. The data in Table 19 are rounded to two significant digits to reflect the underlying uncertainties and approximate level of precision for these estimates. The underlying assumptions for calculating the GHG emission reductions and burdens from use of RAP in new asphalt mixtures are explained in Appendix C.

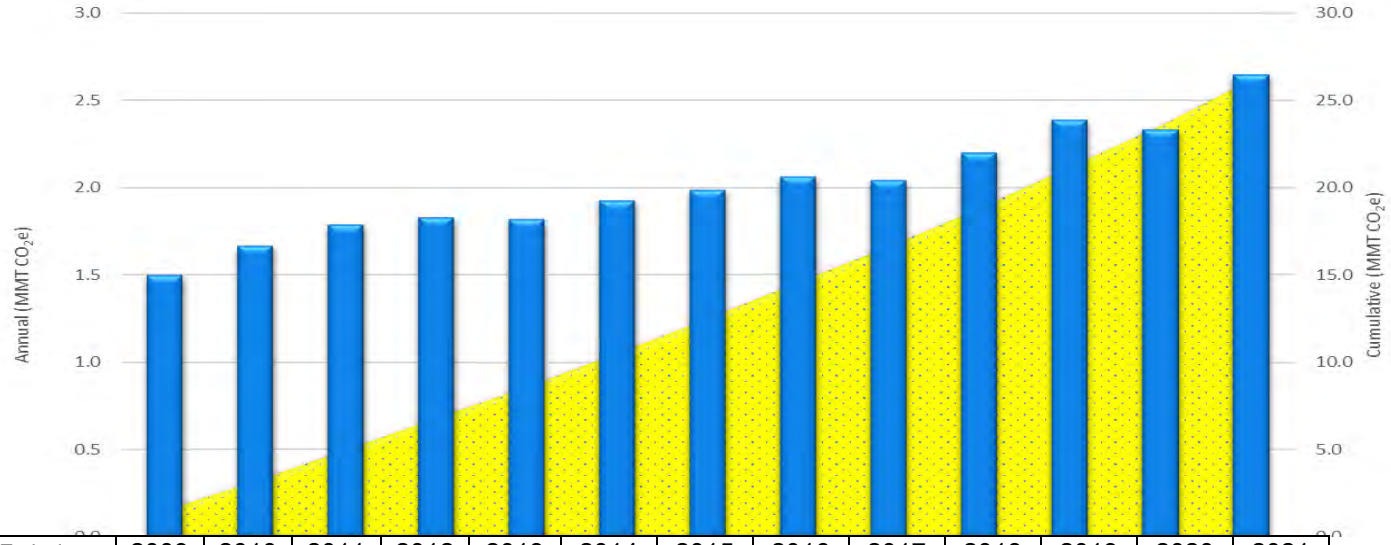
Table 19: Summary of GHG Emission Reductions and Burdens from use of RAP in New Asphalt Mixtures in 2021 (MMT CO_2e)

Description	GHG Reduction (Burden)
Avoided Emissions	
Asphalt Binder Replacement	2.5
Aggregate Replacement	0.35
Transportation of Asphalt Binder and Aggregates	0.45
Subtotal Avoided Emissions	**3.3**
Emission Burdens	
RAP Processing	(0.11)
Transportation of RAP	(0.88)
Subtotal Emission Burdens	(0.99)
Net GHG Emissions Reduction	**2.3**
Equivalent Number of Passenger Vehicles[1]	**510,000**

[1] Assumes that each vehicle emits 4.6 tonne CO_2e/yr (U.S. EPA, 2018).

Annual and cumulative GHG emissions reductions from use of RAP in new asphalt mixtures from previous years of survey data are provided in Figure 19. The cumulative reduction of GHG emissions from use of RAP in new asphalt mixtures for the period 2009-2021 is estimated to be 26.1 MMT CO_2e.

Figure 19: GHG Emissions Reduction from Use of RAP in New Asphalt Mixtures, 2009–2021



GHG Emissions	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021
Cumulative	1.5	3.2	4.9	6.8	8.6	10.5	12.5	14.5	16.6	18.8	21.2	23.5	26.1
Annual	1.5	1.7	1.8	1.8	1.8	1.9	2.0	2.1	2.0	2.2	2.4	2.3	2.6

Other Recycled Materials

Starting with the 2012 construction season survey, a series of questions was asked about the use of other recycled materials in asphalt mixtures. The information requested in the survey is detailed in Appendix A and summarized in Table A1, Section 5.

Producers were asked how many tons of mixture were produced that incorporated other recycled materials, as well as how many tons of specific materials were used in mixture production during the 2021 construction season. In some cases, respondents provided only the tons of asphalt mixture produced using other recycled materials or only the tons of the other recycled materials used, not both. Four recycled materials — recycled tire rubber (RTR), steel slag, blast furnace slag, and cellulose fibers — were specifically listed in the survey. Respondents could specify up to two additional recycled materials used in mixtures.

Because the response rate to these questions about other recycled materials was expected to be low and because producers may not track the use of these materials, State and National estimates of total quantities used for these materials were not calculated. **All values in this section are reported values *only* and do not represent estimates of the total quantity of these materials used in each State or Nationally.** Year-to-year variation in reported values is entirely dependent upon the makeup of the respondents to each year's survey. Where available, third-party data is referenced to provide an understanding of the estimated total usage of these materials.

A total of 68 companies from 32 States, 26.1 percent of survey respondents, reported using more than 1.3 million tons of other recycled materials in about 9.2 million tons of asphalt mixtures during the 2021 construction season.

Recycled Tire Rubber

Table 20 summarizes reported information on the use of RTR, also referred to as ground tire rubber (GTR). Twenty producers from 11 States reported using RTR in some asphalt mixtures. Information about the use of RTR in surface treatments, such as chip seals, was not within the scope of this survey. About 64 percent of the total reported asphalt mixture tonnage produced using RTR came from California, where legislative mandates require the wide-spread use of RTR in asphalt pavements (Caltrans, 2017). The total reported tons of asphalt mixture using RTR decreased approximately 16 percent to 1,131,125 tons (about 0.26 percent of total reported tons for 2021) in the 2021 construction season survey.

While the tonnage produced that incorporates RTR is relatively straightforward to track and report, the tons of RTR used is harder to document due to different methods of producing mixtures that incorporate RTR and the likelihood that RTR is either preblended with binder at the terminal or blended onsite by a third party. Given these factors, producer reports of tons of RTR used versus tons of asphalt mixture produced using RTR were given a heightened level of scrutiny to determine if the reported data was within a reasonable range. When reported tons of RTR fell outside the expected range, producers were contacted to obtain correct values.

To give a picture of the total market size for RTR, the U.S. Tire Manufacturers Association (USTMA) reports that 28.0 percent of U.S. scrap tires were processed into an estimated 1.4 million tons of RTR in 2021. Of this, about 10 percent (140,000 tons) of RTR was used in asphalt pavement mixtures and surface treatments, such as seal coats, and the remaining 90% was used for applications like moldings, mulch, sports fields and other non-pavement related uses in 2021 (USTMA, 2022). USTMA conducts its scrap tire analysis biennially, the RTR use reported by 2021 construction season survey respondents makes up more than 10 percent of the total RTR estimated by USTMA as used in asphalt pavement mixtures and surface treatments.

Table 20: Reported Tons of Asphalt Mixtures Using Recycled Tire Rubber and Reported Tons of RTR Used, 2017–2021

State	Reported Tons of Asphalt Mixtures Using RTR					Reported Tons of RTR Used				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Alabama	—	—	—	—	7300	—	—	—	—	54
Arizona	242,000	342,000	251,350	214,408	158,135	4,600	4,303	2,554	1,689	1,077
Arkansas	—	1,000	—	—	—	—	5	—	—	—
California	407,500	953,444	706,014	542,718	726,455	5,765	13,412	8,587	8,901	11,342
Delaware	—	2,500	—	—	—	—	10	—	—	—
Florida	22,392	9,895	—	—	—	145	136	—	—	—
Georgia	—	63,626	6,667	200,000	102,455	—	378	33	1200	675
Illinois	—	125,000	—	15,400	66,755	—	750	—	100	583
Kentucky	3,000	—	1,000	—	5,000	20	—	5	—	60
Louisiana	5,000	—	—	—	—	35	—	—	—	—
Maine	—	—	—	—	12,000	—	—	—	—	80
Massachusetts	145,333	77,000	145,218	172,380	8,000	1,603	710	2,463	2,998	105
Michigan	12,500	4,500	3,500	80,000	—	125	55	5	3,000	—
Missouri	100,000	36,000	30,000	25,000	10,000	1,500	260	1,500	157	70
Nevada	23,000	—	—	—	—	275	—	—	—	—
Ohio	6,300	—	—	—	—	65	—	—	—	—
Oklahoma	—	—	—	15,000	30,000	—	—	—	12	300
Pennsylvania	—	—	40,000	69,000	—	—	—	160	890	—
Texas	11,000	6,280	5,500	9,500	5,025	40	98	52	78	60
Virginia	1,200	—	34,000	—	—	13	—	156	—	—
Total	974,725	1,621,245	1,223,249	1,343,406	1,131,125	14,186	20,117	15,515	19,025	14,406
No. of Companies	19	21	14	18	20					

NCR = No Companies Responding

— = No Use Reported

Steel & Blast Furnace Slag

Table 21 summarizes the reported use of steel slag and blast furnace slag in asphalt mixtures. Producers in eight States reported using steel slag, and in five States reported using blast furnace slag during the 2021 construction season; in five of these States — Alabama, Indiana, Iowa, Michigan, and Ohio — producers reported using both. Also reported in Table 18 is the use of foundry sand, another byproduct material generated by metal-casting processes at foundries. Not surprisingly, the reported use of slags in asphalt pavement mixtures is most common in regions with steel and iron production industries and thus a relatively available supply of slag aggregates (NSA, n.d.), as seen in Figure 20.

While the total tons of asphalt mixture and materials for each slag type vary from year to year, there was a downward trend in the reported combined use of both slags for 2014 through 2016, as illustrated in Figure 21, but rebounded significantly in 2017 and 2018. The reported slag utilization had been on the decline, with use in 2019 decreasing 36 percent and then 2020 decreasing 31 percent, but 2021 rebounded by 54 percent in year over comparisons. The fluctuating number of companies reporting slag use and the specific companies that did or did not participate in each survey impact these utilization trends. There was no reported use of foundry sand in 2021, which matched 2020 and 2019.

The U.S. Geologic Survey estimates that about 17.0 million tons of iron and steel slag was sold in 2021, divided equally by weight between blast furnace slag and steel slag (USGS, 2022). About 13 percent of this (2.19 million tons) was estimated as used in asphalt pavement mixtures in 2018 (van Oss, 2021). With 1.3 million tons of slag materials reported as being used in asphalt mixtures during the 2021 construction season, this survey captures more than 60 percent of total slag estimated to be used in asphalt pavement mixtures. For the States reporting slag use, slightly more than 7 percent of their total reported asphalt pavement mixture tonnage includes steel and/or blast

furnace slag. According to the American Foundry Society, between 4 million and 7 million tons of foundry sand are available for recycling annually (AFS, n.d.), identifying there remains a significant potential for use in asphalt pavement mixtures in the future.

Table 21: Reported Tons for Steel Slag, Blast Furnace Slag, & Foundry Sand and Tons of Asphalt Mixture Using Each Material, 2017–2021

State & Material	Reported Tons of Mixture Using Material					Reported Tons of Material Used				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Steel Slag										
Alabama	755,764	985,000	985,015	741,000	1,104,097	164,229	195,500	190,252	163,500	225,179
Arkansas	49,005	148,533	63,901	131,500	25,874	10,238	26,658	5,195	24,500	4,770
Illinois	10,000	4,002	1,466	81,000	105,000	8,100	869	450	19,000	31,500
Indiana	132,500	328,214	84,997	194,546	214,614	45,929	110,777	72,937	54,301	63,591
Iowa	25,000	75,000	2,500	30,000	12,500	4,500	13,000	900	7,500	2,500
Kentucky	45,853	—	25,000	—	—	4,603	—	2,500	—	—
Michigan	367,652	1,847,249	1,400,000	1,964,335	1,739,824	259,252	225,818	215,000	285,000	121,755
Minnesota	140,000	115,000	102,000	25,000	—	28,500	20,000	15,000	5,000	—
Mississippi	—	5,000	36,187	120,075	—	—	250	1,394	4,683	—
Missouri	—	38,599	22,430	—	—	—	6,431	3,645	—	—
Ohio	145,868	145,000	155,000	225,000	130,000	30,556	30,000	32,000	45,000	28,000
Tennessee	—	30,000	—	—	—	—	3,000	—	—	—
Washington	413,000	395,000	367,000	338,000	350,000	53,300	48,000	36,000	35,000	49,000
Total	2,064,642	4,116,597	3,245,496	3,850,456	3,681,909	609,207	680,303	575,273	643,484	526,295
No. of Companies	18	23	14	18	17					
Blast Furnace Slag										
Alabama	177,933	375,000	252,653	122,000	173,279	39,379	85,500	54,530	13,500	15,145
Illinois	—	—	505	8,000	—	—	—	100	4,000	—
Indiana	1,001,700	1,660,356	972,970	256,356	1,431,913	336,413	548,431	319,465	29,000	434,037
Iowa	—	—	1,000	—	12,500	—	—	350	—	2,500
Kentucky	600,000	150,000	80,000	—	—	100,000	30,000	20,000	—	—
Michigan	393,239	470,015	319,449	138,889	1,005,778	156,741	110,220	116,670	14,000	183,875
Mississippi	11,534	—	—	—	—	1,150	—	—	—	—
Missouri	—	1,630	—	—	—	—	489	—	—	—
Ohio	660,395	595,263	623,238	590,996	628,558	164,861	149,580	155,758	151,770	156,945
Pennsylvania	—	—	—	5,000	—	—	—	—	2,500	—
Tennessee	—	60,000	—	—	—	—	6,000	—	—	—
West Virginia	150,000	1,052,500	—	—	—	22,500	137,958	—	—	—
Total	2,994,801	4,364,764	2,249,815	1,121,241	3,252,028	821,044	1,068,178	666,873	214,770	792,502
No. of Companies	13	18	14	13	12					
Foundry Sand										
Missouri	10,000	—	—	—	—	1,000	—	—	—	—
Texas	—	50,000	—	—	—	—	4,800	—	—	—

— = No Use Reported

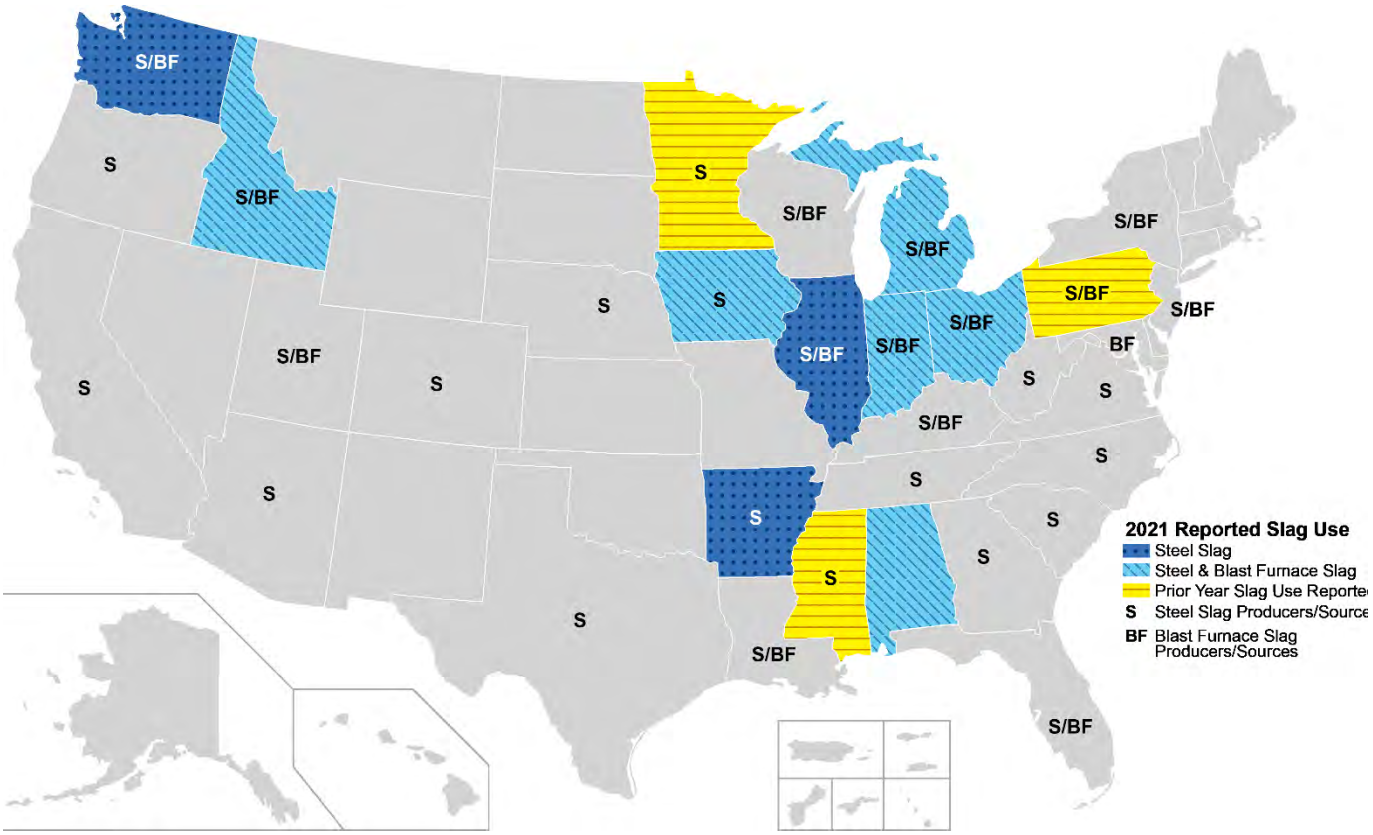


Figure 20: States Reporting Steel and/or Blast Furnace Slag Use and Slag Producers/Sources, 2021

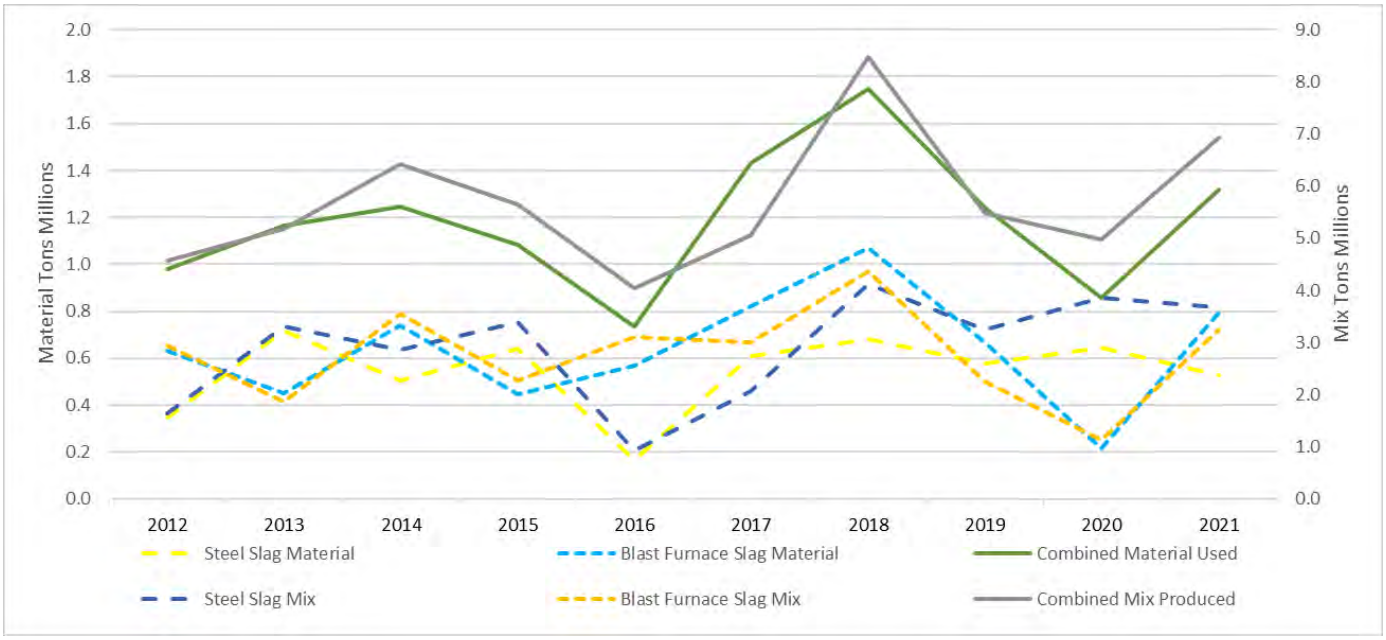


Figure 21: Steel and Blast Furnace Slag Use, 2012–2021

Recycled Fibers

Table 22 summarizes the use of various types of recycled fibers used in asphalt mixtures. For the 2021 construction season, producers only reported using recycled cellulose fibers. The reported use of cellulose fiber increased significantly beginning in 2015, due to the specific request for data about cellulose fiber starting with the 2015 construction season survey. As explained in Appendix A, in previous years, reporting data about cellulose fiber use was at the discretion of the respondent. During the 2021 construction season, producers from 22 States reported using more than 2,400 tons of recycled fibers in nearly 950,000 tons of asphalt pavement mixture.

Table 22: Recycled Fibers, 2017–2021

State & Material	Reported Tons of Mixture Produced Using Recycled Fibers*					Reported Tons of Other Recycled Fibers*				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Cellulose Fibers										
Alabama	193,268	196,000	4,232	132,817	40,000	720	655	18	773	90
Arkansas	—	250	—	600	—	—	1	—	2	—
California	—	36,865	33,621	57,148	43,726	—	55	109	86	22
Connecticut	—	500	—	2200	1,758	—	2	—	7	1
Delaware	—	12,000	—	15,000	20,000	—	36	—	500	6
Dist. of Columbia	—	1,006	28,000	1,065	500	—	5	100	4	1
Florida	165,863	193,450	35,500	—	161,300	663	362	124	—	484
Georgia	—	370,934	304,877	425,000	113,384	—	1,170	1,045	1,300	304
Idaho	—	1,500	—	—	—	—	5	—	—	—
Illinois	—	—	—	442,900	90,131	—	—	—	1,320	283
Kentucky	—	35,000	—	—	—	—	105	—	—	—
Maryland	125,000	138,000	—	115,000	65,000	373	414	—	2090	87
Massachusetts	—	—	—	350	—	—	—	—	1	—
Michigan	145,200	151,728	152,865	60,000	4,100	84	231	174	80	4
Minnesota	—	14,000	12,000	152,200	5,800	—	22	100	506	2
Mississippi	40,173	60,000	133,236	218,794	18,899	121	400	513	534	57
Missouri	60,000	136,000	36,458	153,000	63,400	180	3,108	166	325	190
New York	—	500	1,160	9,000	1,000	—	1	5	5	1
North Dakota	—	—	—	60,000	—	—	—	—	180	—
Ohio	6	16,750	1,350	—	—	0	50	3	—	—
Oklahoma	—	—	—	47,000	—	—	—	—	26	—
Oregon	—	—	50,000	—	—	—	—	165	—	—
Pennsylvania	21,000	84,300	17,717	63,880	5,000	88	211	52	540	10
South Dakota	—	—	—	—	20,000	—	—	—	—	65
Tennessee	113,000	27,000	—	—	16,000	300	180	—	—	48
Texas	20,000	79,700	215,000	63,000	50,016	60	554	235	13	146
Utah	120,696	149,135	277,000	128,400	71,301	336	746	530	302	213
Virginia	—	116,000	90,000	50,000	55,500	—	348	271	50	167
Washington	—	5,000	—	—	100,000	—	100	—	—	300
Wisconsin	—	—	—	52,000	500	—	—	—	104	1
Carbon Fibers										
Washington	—	2,000	—	—	—	—	50	—	—	—
Total	1,004,206	1,825,618	1,393,016	2,249,354	948,315	2,925	8,761	3,610	8,748	2,482
No. of Companies	20	43	28	42	31					

*Not all producers reporting tonnages of mixtures using other recycled materials provided quantities of recycled materials used and vice versa.
NCR = No Companies Responding; — = No Use Reported

Coal Combustion Products

Several waste and by-products associated with the burning of coal to produce electricity, including fly ash, bottom ash, boiler slag and flue-gas desulfurization (FGD) materials, are used in asphalt pavement mixtures as a cost-effective mineral filler that can help increase mixture stiffness and reduce asphalt drain down. In the 2021 construction season survey, fly ash was the only one of these coal combustion products (CCP) reported as being used, as shown in Table 23. In previous survey years, limited use of bottom ash was reported in 2012 in South Dakota and in 2015 in Texas.

To give a picture of the total use of CCP in asphalt pavement mixtures, the American Coal Ash Association found that some 16,195 tons of fly ash, no bottom ash, no boiler slag, and 2,226 tons of FGD material from dry scrubbers and others were used as mineral filler in asphalt in 2020 (ACAA, 2021). 2021 Data was not available from the ACAA at the time of writing. Fly ash usage reported for the 2021 construction season survey is about 10 percent of total fly ash used as a mineral filler in asphalt pavements; however, only a very small amount (0.005 percent) of the 40.7 million tons of coal combustion products produced in 2020 were used in asphalt mixtures, according to ACAA

(2021). Unlike with slags, there is no apparent correlation between the location of coal-fired power plants and the use of CCP in asphalt pavement mixtures.

Table 23: Reported Tons of Asphalt Mixtures Using Coal Combustion Products and Reported Tons of CCP Used, 2017–2021

State & Material	Reported Tons of Asphalt Mixtures Using CCP*					Reported Tons of CCP Used*				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Fly Ash										
Alabama	58,253	160,000	—	51,417	—	2,625	5,100	—	2,007	—
Georgia	—	3,068	—	50,000	—	—	53	—	2,000	—
Illinois	95,750	—	—	12,000	—	1,500	—	—	300	—
Michigan	—	—	30,000	—	—	—	—	700	—	—
Mississippi	141,767	—	39,687	120,075	—	4,253	—	1,076	3,242	—
Missouri	60,000	—	—	110,000	—	4,000	—	—	2,334	—
North Dakota	—	—	—	60,000	—	—	—	—	2,400	—
South Carolina	—	—	—	—	10,000	—	—	—	—	700
South Dakota	—	—	—	—	20,000	—	—	—	—	400
Texas	20,000	110,000	175,000	—	—	600	3,300	8,750	—	—
Utah	—	—	—	—	16,000	—	—	—	—	600
Wisconsin	40,000	60,000	—	32,000	—	4,000	3,600	—	1,600	—
Total (All CCP)	415,770	333,068	244,687	435,492	46,000	16,978	12,053	10,526	13,883	1,700
No. of Companies	10	5	4	8	3					

*Not all producers reporting tonnages of mixtures using other recycled materials provided quantities of recycled materials used and vice versa.
NCR = No Companies Responding
— = No Use Reported

Other Recycled Materials

Table 24 summarizes other recycled materials reported as used in asphalt mixtures, for the 2021 construction season producers reported using plant start-up waste, recycled toner pellets, and recycled polyethylene. In previous years, producers have also reported the use of blasting sand, crushed concrete aggregate, marble production dust, recycled glass, and petroleum-contaminated soil in asphalt pavement mixtures.

Table 24: Other Recycled Materials, 2017–2021

State & Material	Reported Tons of Mixture Produced Using Other Recycled Material*					Reported Tons of Other Recycled Material Used*				
	2017	2018	2019	2020	2021	2017	2018	2019	2020	2021
Blasting Sand										
South Carolina	—	—	—	25,000	—	—	—	—	5,000	—
Crushed Concrete Aggregates										
Florida	—	10,000	—	—	—	—	—	1,000	—	—
Marble Production Dust										
Georgia	—	—	—	50,000	—	—	—	—	500	—
Plant Start-Up Waste										
Missouri	—	15,000	—	5,000	6,000	—	4,000	—	500	600
Recycled Toner Pellets										
Virginia	—	—	—	—	125,200	—	—	—	—	375
Recycled Polyethylene (rPE)										
Pennsylvania	—	—	—	—	1,600	—	—	—	—	1
Wisconsin	—	—	—	1,000	—	—	—	—	5	—
Total	—	25,000	—	81,000	132,800	—	5,000	—	6,005	976

* Not all producers reporting tonnages of mixtures using other recycled materials provided quantities of recycled materials used and vice versa.
NCR = No Companies Responding; — = No Use Reported

In-place Recycling

Starting with the 2019 construction season survey, a supplemental survey was conducted to gather information about the use of in-place recycling techniques. The specific in-place recycling techniques the survey asked about included cold in-place recycling, hot in-place recycling, cold central plant recycling, and full-depth reclamation techniques. The information requested in the survey is detailed in Appendix A and summarized in Table A3, Sections 1 and 2.

Contractors were asked the quantity of recycled asphalt pavement processed as part of each in-place recycling technology during the 2021 construction season. Because different units of measurement may be used for each in-place recycling technology, respondents were asked to provide both a quantity and the unit of measure, for example tons, metric tonnes, cubic yards, square yards at inches of thickness, and so forth. All values provided within this report will be in tons; respondent quantities that were provided in a unit of volume were converted to tons with a compacted unit weight of 149.3 lbs. per cubic foot.

Because the response rate to the supplemental survey on in-place recycling remains low, State and National estimates of total quantities used for these materials were not calculated. **All values in this section are reported values *only* and do not represent estimates of the total quantity of these materials used in each State or Nationally.**

A total of 25 companies, from three of the four User Producer Group regions, reported using more than 4.8 million tons of recycled asphalt pavement while completing the in-place recycling process during the 2021 construction season.

In-Place Recycling Use by User Producer Group Region

Figure 22 shows the total reported tons for cold in-place recycling, hot in-place recycling, cold central plant recycling, and full-depth reclamation techniques separated by User/Producer Group (UPG) region during the 2021 construction season. The North Central Asphalt User/Producer Group (NCAUPG) region had the most respondents (12 companies); the region also accounted for more than 72 percent of the in-place recycling tonnage reported for 2021. The NCAUPG region had tonnage reported for three of the four techniques with FDR being 60 percent and the highest tonnage for the region. The North East Asphalt User/Producer Group (NEAUPG) had no respondents to the in-place recycling survey. The Southeastern Asphalt User/Producer Group (SEAUPG) and the combined Rocky Mountains Asphalt User/Producer Group (RMAUPG) and Pacific Coast Conference on Asphalt Specification (PCCAS) regions, had 10 and 3 companies respond respectively. The SEAUPG region had tonnage reported for all four techniques, while the combined RMAUPG and PCCAS regions had no reported tonnage for HIR. The total reported tonnage was up (30 percent) from 3.7 million tons in 2020, to 4.8 million tons in 2021, with responses increasing (19 percent) from 21 companies in 2020 to 25 companies in 2021.

Region	Companies	(tons)			
		HIR	CCPR	CIR	FDR
NCAUPG	12	0	26,841	1,356,647	2,121,525
SEAUPG	10	50,000	56,364	265,633	802,369
RMAUPG / PCCAS	3	0	10,000	46,804	89,600
NEAUPG	NCR	NCR	NCR	NCR	NCR
2021 Totals	**25**	**50,000**	**93,205**	**1,669,084**	**3,013,494**
2020 Totals	**21**	**430,682**	**494,500**	**1,317,655**	**1,461,807**
2019 Totals	**28**	**319,600**	**8,400**	**2,100,952**	**1,830,416**

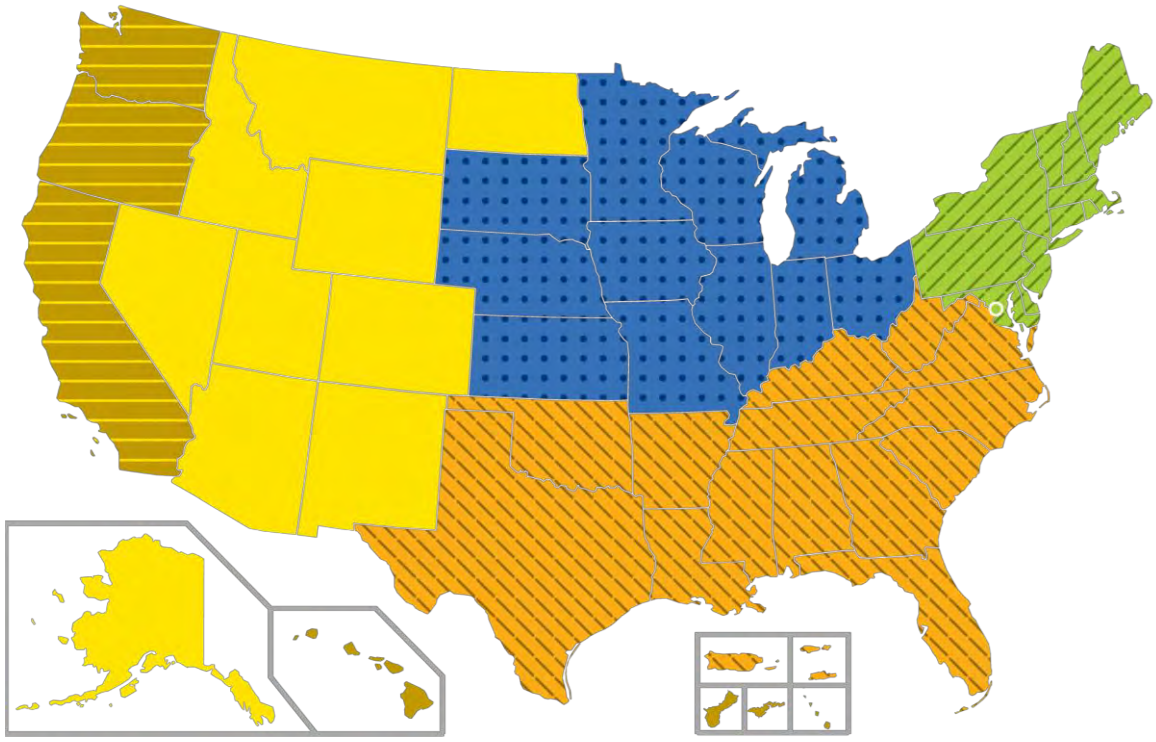


Figure 22: In-place Recycling Tonnages, 2021

Historical Trends

Since 2009 this annual survey has quantified and documented the use of recycled materials and WMA produced by the asphalt pavement mixture production industry. Throughout the report there are figures and tables provided which show production changes and trends that have occurred over this time period.

Historical trends from the 2009 to 2021 construction season surveys:

- Industry participation in this voluntary survey has increased in terms of both number of companies and number of plant production facilities, which is a critical factor in ensuring the survey is providing accurate estimates for the industry's annual asphalt production as well as the utilization of recycled materials and WMA. Table 2 provides the annual breakdown of participation, showing that participation has increased by 33 percent in terms of company responses and 35 percent in terms of plant production facilities for the 2009 to 2021 time frame.

- The year over year change in total asphalt mixture production has been relatively stable over the history of the survey, with 2019 (8% increase in tonnage compared to 2018) and 2021 (6% increase in tonnage compared to 2020) being the only years with over a 5 percent change. Figure 2 provides the annual asphalt mixture production estimates and illustrates that 2012, 2013, and 2020 are the three construction seasons that saw a downturn in production, with - 2 percent, - 3 percent, and - 3 percent respectively.
- The National average percent RAP utilized in asphalt mixtures has gradually increased since 2009, with a 40 percent overall increase in average percent RAP, starting at 15.6 percent RAP in 2009 and reaching 21.9 percent in 2021. Figure 3 provides a graphical illustration of the tonnage of RAP that has been utilized as a result of the increased percent utilization on the asphalt production tonnages over the history of the survey.
- RAS tons utilized in asphalt mixtures peaked in 2014 and have steadily decreased in utilization for all sectors through 2020, but then had a 7 percent increase in utilization for the 2021 construction season. Figure 9 and Figure 10 show the annual tonnages of RAS utilization and provide visuals on the decreasing use by all sectors since reaching the peak utilization level.
- WMA has seen steady growth in all sectors since 2009, with the accumulated growth over the history of the survey in 2021 of more than 959 percent from the estimated 16.8 million tons of WMA production in the 2009 construction season. The estimated annual WMA production for each sector is provided in Table 16.
- The majority of the WMA market is made up of two WMA technologies, plant-based foaming and chemical additives. Plant-based foaming peaked in 2011 at over 95 percent of the market while that was the low for the chemical additive technology at just 4 percent of the market in 2011. As seen in Table 15 and Figure 18, plant-based foaming has steadily decreased since 2011 and chemical additives have steadily increased market share, with plant-based foaming at 37 percent and chemical additives at 60 percent in 2021.
- Additionally, the survey has collected new information and provided further details over its history. Most recently collecting additional information on amount of temperature reduction while employing warm mix additives, which started with the 2021 Construction season. Other recent additions include the collection of in-place recycling techniques which started for the 2019 construction season, as well as the addition of the Energy and Greenhouse Gas Emissions analysis section of the report which was debuted in the 2019 construction season report.

Summary and Conclusions

The objective of this survey was to quantify the use of recycled materials and WMA produced by the asphalt pavement mixture production industry during the 2021 construction season. Asphalt mixture producers from 50 States and the District of Columbia completed the 2021 survey. Responses came from 261 companies with data from 1,388 production plants. Data collected was compared to annual data from previous surveys since the 2009 construction season.

The survey findings for 2021 regarding the use of RAP, RAS, and WMA are summarized in Table 4.

Comparing the 2021 results to 2020 construction season, estimated total asphalt mixture production saw an increase to 432.4 million tons from 407.8 million tons, a 6 percent increase. DOT tonnage increased 5.5 percent, mixture production for the Other Agency sector increased by 6.4 percent, and the Commercial and Residential sector also increased by 6.4 percent from 2020 to 2021.

The use of RAP has risen dramatically since the 2009 construction season survey; 2021 saw an increase in RAP tonnage used in asphalt mixtures of 8.7 percent above 2020, which was driven by both increased asphalt mixture tonnage in 2021 and an increase (0.6 percent) in the average percentage of RAP utilized in the production of new asphalt mixtures.

The 2021 construction season survey shows:

Reclaimed Asphalt Pavement

- The total estimated tons of RAP used in asphalt mixtures was 94.6 million tons in 2021. This represents a 68.9 percent increase in the total estimated tons of RAP used in 2009. During the same time frame, total asphalt mixture tonnage increased only 20.6 percent.
- The percentage of producers reporting use of RAP was 100 percent of respondents which is up 1.1 percent from 2020.
- The average percent RAP used by all sectors has seen variable growth from 2009 to 2020. The average estimated percentage of RAP used in asphalt mixtures has increased from 15.6 percent in 2009 to 21.9 percent in 2021.
- Companies reporting having stockpiled RAP on hand at year-end increased from 97.1 percent in 2020 to 97.7 percent in 2021. In total, producers accepted an estimated 101.3 million tons and used an estimated 99.1 million tons in 2021.
- Reclaiming 101 million tons of RAP for future use saved about 61.5 million cubic yards of landfill space.
- The total estimated amount of RAP stockpiled nationwide at the end of the 2021 construction season was 137 million tons.
- Producers from 31 States reported fractionating RAP. Nationally, a reported 25 percent of RAP is fractionated.
- Producers from 27 States reported using softer binders and 22 States reported using recycling agents in RAP mixtures. There was little correlation between the percentage of RAP used in asphalt pavement mixtures and the use of softer binders and/or recycling agents in a given State.

Reclaimed Asphalt Shingles

- Use of both recycled MWAS and PCAS in asphalt mixtures increased (8 percent) from an estimated 586,000 tons in 2020 to 630,000 tons in 2021.
- The amount of unprocessed RAS accepted by asphalt mixture producers decreased from 514,000 tons in 2020 to 395,000 tons in 2021. An estimated 385,000 tons of processed RAS was also accepted by producers, which was about 107,000 tons more processed RAS than was accepted in 2020. The combined amount of unprocessed and processed RAS accepted in 2021 was 781,000 tons, which was 147,000 tons more RAS than was used for all purposes during the 2021 construction season.
- Of the unprocessed RAS accepted by producers in 2021, 230,000 tons was PCAS and 165,000 tons was MWAS.
- Of the RAS used in 2021, more than 99 percent was used in asphalt mixtures. The remainder was in other civil engineering applications. No producers reported landfilling of RAS during the 2021 construction season.
- The percent of producers reporting use of RAS increased from 20.8 percent of respondents in 2020 to 24.9 percent in 2021.
- The total estimated amount of RAS stockpiled nationwide at the end of the 2021 construction season was nearly 1.13 million tons.
- Accepting 395,00 tons of unprocessed RAS from both PCAS and MWAS sources diverted about 240,000 cubic yards of material from landfills.
- The number of States with producers reporting RAS use was 25 in 2021. Iowa producers for the second time since the beginning of the survey reported no RAS use, while still reporting that RAS is allowed in some mixtures for all sectors.
- Commercial & Residential sectors allow the use of RAS in most States, with more limited use in DOT and Other Agency public sector mixtures, according to producer and SAPA reports. No States reportedly allow

the use of RAS in all mixes for all sectors, and five States reportedly do not approve the use of RAS in asphalt pavement mixtures for any sector.

- Producers from 15 States reported using softer binders and seven States reported using recycling agents in RAS mixtures.

Material Cost Savings

- The use of RAP and RAS saved more than $3.5 billion during the 2021 construction season compared to the use of all virgin materials. These savings help reduce material costs for asphalt pavement mixtures, allowing road owners to achieve more roadway maintenance and construction activities within limited budgets.
- The diversion of RAP and RAS from landfills during the 2021 construction season save nearly 62 million cubic yards of space in construction and demolition landfills, as well as more than $5.1 billion in gate fees associated with the disposal of RAP and RAS.

Other Recycled Materials

- A reported total of more than 1.3 million tons of other recycled materials was used in about 9.2 million tons of asphalt mixtures by 68 companies in 32 States during the 2021 construction season.
- Twenty producers from 11 States reported use of recycled tire rubber (RTR) in asphalt mixtures during the 2021 construction season. The total reported tons of asphalt mixture using RTR decreased 16 percent from 2020 to 1,131,000 tons in the 2021 construction season.
- Producers in 8 States reported use of steel or blast furnace slags, and no States reported the use of foundry sand in 2021. Compared to reported use in 2020, the reported tons of mixtures including steel slag and mixtures including blast furnace slag increased 39 percent during the 2021 construction season. Reported use of these materials was concentrated along the Mississippi and Ohio River Valleys, where much of U.S. steel and iron production is concentrated.
- Producers in three States reported using fly ash in asphalt mixtures in 2021. Fly ash was the only coal combustion product (CCP) reported as being used in asphalt pavement mixtures during the 2021 construction season.
- Producers in 22 States reported use of more than 2,400 tons of recycled cellulose fiber in nearly 950,000 tons of asphalt pavement mixtures during 2021.

Warm Mix Asphalt

The use of WMA technologies has increased significantly since 2009. The 2021 construction season survey shows:

- The estimated total tonnage of asphalt pavement mixtures produced with WMA technologies for the 2021 construction season was about 177.9 million tons. This was a 5 percent decrease from the estimated 186.4 million tons of mixture produced with WMA technologies in 2020 and a more than 959 percent increase from the estimated 16.8 million tons in the 2009 construction season.
- Mixtures produced with WMA technologies made up 41.1 percent of the total estimated asphalt mixture market in 2021. About 52.9 percent (94.1 million tons) of these mixtures were produced with a temperature reduction of at least 10°F.
- In addition, producers using WMA technologies in six States — Connecticut, Louisiana, Mississippi, Pennsylvania, Virginia, and Wyoming — reported producing more than 75 percent of their total tonnage with WMA technologies.
- Production plant foaming, representing nearly 38 percent of the market in 2021, was no longer the most commonly used warm-mix technology, with utilization decreasing about 57.7 percent since its peak in the 2011 construction season.

- Chemical additive technologies accounted for a little more than 60 percent of the market in 2021, a 29 percent increase from their use in the 2020 construction season.
- The decrease in plant-based foaming technologies been seen in the survey since 2011.
- There appears to be some variation in the use of WMA technology based upon production temperature.
- About 62 percent of survey respondents reported producing asphalt mixture with WMA technologies; 161 producers in 45 States reported using WMA technologies.

Conclusions

The 2021 survey results show that the asphalt pavement mixture production industry has a strong record of sustainable practices and continues to innovate through the use of recycled materials and WMA. Since the initial industry survey of the 2009 construction season, producers have significantly increased their use of recycled materials and WMA; however, since the 2013 survey, indicators are that the rate of increase of adoption has slowed.

The amount of RAP received was 2.1 million tons more than what producers utilized during the 2021 construction season, with 97.7 percent of producers indicated they have stockpiled RAP on hand. With an estimated 137.5 million tons of RAP stockpiled nationwide at year-end 2021, opportunities remain to increase the amount of RAP used in asphalt mixtures through engineering, performance-based specifications, education, improved RAP processing, production equipment, and procedures.

RAS use saw a 7 percent increase in 2021 in asphalt pavement mixtures; by accepting 395,000 tons of waste shingles during 2021, producers diverted about 2.6 percent of the Nation's available waste shingles for use in asphalt mixtures. An estimated 1.13 million tons of RAS was stockpiled nationwide at year-end 2021. As with RAP, performance-based specifications, education, improved processing, production equipment, and procedures will help increase the amount and percentages of RAS used in asphalt mixtures.

The asphalt pavement mixture production industry repurposes many products from other industries. The survey shows that, for the 2021 construction season, slag use was reported in 8 States, RTR use was reported in 11 States, recycled cellulose use was reported in 22 States, and fly ash use in three States.

The tonnage of asphalt pavement mixtures produced with WMA technologies saw a 5 percent decrease during the 2021 construction season with a total production of 177.9 million tons, which represents 41.1 percent of total estimated asphalt mixture production for the year. Producers in Georgia, Hawaii, Montana, Rhode Island, and South Dakota reported not producing mixtures with WMA technologies in 2021.

References

ACAA (2021). 2020 Coal Combustion Product (CCP) Production & Use Survey Report. American Coal Ash Association, Farmington Hills, Michigan. https://www.acaa-usa.org/publications/productionusereports.aspx [Accessed December 2022]

AFS (n.d.). Introduction to Foundry Sand [web page]. American Foundry Society, Schaumburg, Illinois. https://www.afsinc.org/introduction-foundry-sand [Accessed 24 May 2019]

Boxman, S., & Staley, B.F. (2022). Analysis of MSW Tipping Fees — September 2021. Environmental Research & Education Foundation, Raleigh, N.C.

Caltrans (2017). *2015 Crumb Rubber Report: Cost Differential Analysis Between Asphalt Containing Crumb Rubber and Conventional Asphalt*. California Department of Transportation, California State Transportation Agency, Sacramento, California.

Carvalho, R.L., H. Shirazi, M. Ayres Jr., & O. Selezneva (2010). Performance of Recycled Hot-Mix Asphalt Overlays in Rehabilitation of Flexible Pavements. In *Transportation Research Record: Journal of the Transportation Research Board, No. 2155*, pp. 55–62. Transportation Research Board of the National Academies, Washington, D.C. doi:10.3141/2155-06

CIF (2013). 2013 NOVA Award Winner — Warm Mix Asphalt. Construction Innovation Forum, Walbridge, Ohio. http://youtu.be/q47p1SAy4g4 [Accessed 14 August 2014]

Copeland, A. (2011). *Reclaimed Asphalt Pavement in Asphalt Mixtures: State of the Practice*. Report FHWA-HRT-11-021. Federal Highway Administration, McLean, Virginia.

Copeland, A., C.L. Jones, & J. Bukowski (2010). Reclaiming Roads. *Public Roads*, Vol. 73, No. 5 (March/April). Publication FHWA-HRT-10-001. http://www.fhwa.dot.gov/publications/publicroads/10mar/06.cfm [Accessed 14 August 2014]

FHWA (2013). Every Day Counts: Warm Mix Asphalt [website]. Federal Highway Administration, Washington, D.C. http://www.fhwa.dot.gov/publications/publicroads/10mar/06.cfm [Accessed 14 August 2014]

FHWA (2021). *Resource Responsible Use of Reclaimed Asphalt Pavement in Asphalt Mixtures TechBrief*. Federal Highway Administration, Washington, D.C. FHWA-HIF-22-003

Hansen, K.R., & A. Copeland (2013a). *2nd Annual Asphalt Pavement Industry Survey on Reclaimed Asphalt Pavement, Reclaimed Asphalt Shingles, and Warm-Mix Asphalt Usage: 2009–2011* (IS 138). National Asphalt Pavement Association, Lanham, Maryland.

Hansen, K.R., & A. Copeland (2013b). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2009–2012, 3rd Annual Survey* (IS 138). National Asphalt Pavement Association, Lanham, Maryland.

Hansen, K.R., & A. Copeland (2014). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2009–2013, 4th Annual Survey* (IS 138). National Asphalt Pavement Association, Lanham, Maryland.

Hansen, K.R., & A. Copeland (2015). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2014, 5th Annual Survey* (IS 138). National Asphalt Pavement Association, Lanham, Maryland.

Hansen, K.R., & A. Copeland (2017). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2015, 6th Annual Survey* (IS 138). National Asphalt Pavement Association, Lanham, Maryland.

Hansen, K.R., A. Copeland, & T.C. Ross (2017). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2016, 7th Annual Survey* (IS 138). National Asphalt Pavement Association, Lanham, Maryland.

Hansen, K.R., & D.E. Newcomb (2011). *Asphalt Pavement Mix Production Survey: Reclaimed Asphalt Pavement, Reclaimed Asphalt Shingles, Warm-Mix Asphalt Usage: 2009–2010* (IS 138). National Asphalt Pavement Association, Lanham, Maryland.

IDOT (2021). Illinois Highway Materials Sustainability Efforts 2020. Springfield, IL: Illinois Department of Transportation, Bureau of Materials and Physical Research. https://idot.illinois.gov/Assets/uploads/files/Transportation-System/Research/Physical-Research-Reports/PRR%20173_Recycling%20Report.pdf

NSA (n.d.). Slag Availability [web page]. National Slag Association, Pleasant Grove, Utah. http://nationalslag.org/slag-availability [Accessed December 2022]

Pappas, J. (2011). Recycling Materials Survey. Presented at the RAP Expert Task Group May Meeting, May 2011, Irvine, California. http://www.morerap.us/files/meetings/05-11/pappas-recycling-materials-survey.pdf [Accessed 14 August 2014]

Prowell, B.D., G.C. Hurley, & B. Frank. (2012). *Warm-Mix Asphalt: Best Practices, 3rd Edition* (QIP 125). National Asphalt Pavement Association, Lanham, Maryland.

Prowell, B.D., R.J. Schreck, & S. Sasaki (2011). Evaluation of Compaction Benefits of Foamed Asphalt Mixtures at Varying Production Temperatures. Presented at 2nd International Warm-Mix Conference, 11–13 October 2011, St. Louis, Missouri.

Tolaymat, T., M. Krause, J. Smith, & T. Townsend (2017). The State of the Practice of Construction and Demolition Material Recovery (EPA/600/R-17/231). U.S. Environmental Protection Agency, Washington, D.C.

U.S. EPA (2018). *Questions and Answers: Greenhouse Gas Emissions from a Typical Passenger Vehicle.* Office of Transportation and Air Quality, EPA-420-F-18-008.

U.S. EPA (2020). *Advancing Sustainable Materials Management: 2018 Fact Sheet*. Office of Land and Emergency Management, EPA 530-F-20-009

USGS (2022). Mineral Commodities Summaries 2022. U.S. Geological Survey, Reston, Virginia. doi:10.3133/mcs2022.

USTMA (2022). *2021 U.S. Scrap Tire Management Summary*. U.S. Tire Manufacturers Association, Washington, D.C.

van Oss, H.G. (2021). Slag—Iron and Steel. In *2018 Minerals Yearbook*, pp. 69.4. U.S. Geological Survey, Reston, Virginia.

West, R.C. (2016). *Best Practices for RAP and RAS Management* (QIP 129). National Asphalt Pavement Association, Lanham, Maryland.

West, R.C., J. Michael, R. Turochy, & S. Maghsoodloo (2011). Use of Data from Specific Pavement Studies Experiment 5 in the Long-Term Pavement Performance Program to Compare Virgin and Recycled Asphalt Pavements. In *Transportation Research Record: Journal of the Transportation Research Board, No. 2208*, pp. 82–89. Transportation Research Board of the National Academies, Washington, D.C. doi:10.3141/2208-11

West, R.C., M.C. Rodezno, G. Julian, B.D. Prowell, B. Frank, L.V. Osborn, & A.J. Kriech (2014). *NCHRP Report 779: Field Performance of Warm-Mix Asphalt Technologies*. Transportation Research Board of the National Academies, Washington, D.C. doi:10.17226/22272

Williams, B.A., A. Copeland, & T.C. Ross (2018). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2017, 8th Annual Survey* (IS 138). National Asphalt Pavement Association, Lanham, Maryland. doi:10.13140/RG.2.2.30240.69129

Williams, B.A., J.R. Willis, & T.C. Ross (2019). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2018, 9th Annual Survey* (IS 138). National Asphalt Pavement Association, Greenbelt, Maryland. DOI: 10.13140/RG.2.2.22077.61920

Williams, B.A., J.R. Willis, & Shacat, J. (2020). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2019, 10th Annual Survey* (IS 138). National Asphalt Pavement Association, Greenbelt, Maryland. DOI: 10.13140/RG.2.2.21946.82888

Williams, B.A., J.R. Willis, & Shacat, J. (2021). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2020, 11th Annual Survey* (IS 138). National Asphalt Pavement Association, Greenbelt, Maryland. DOI: 10.13140/RG.2.2.14846.46409

NATIONAL ASPHALT
PAVEMENT ASSOCIATION

National Asphalt Pavement Association
6406 Ivy Lane, Suite 350
Greenbelt, Maryland 20770-1441
www.AsphaltPavement.org
napa@AsphaltPavement.org
Toll Free: 888-468-6499
Tel: 301-731-4748
Fax: 301-731-4621

Publications
Login at https://member.asphaltpavement.org/Shop/Product-Catalog

12th Annual Asphalt Pavement Industry Survey
IS 138

ASPHALT
100% RECYCLABLE

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Asphalt Pavement Industry Survey on

Recycled Materials and Warm-Mix Asphalt Usage 2021

IS-138 Appendix A:
Methodology & Survey Forms

Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2021 Appendix A

Appendix A to the twelfth edition of *Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage* (Williams et al., 2022) provides details on the methodology used to collect and analyze the 2021 construction season survey data and reproduces the primary survey instruments used to collect data from asphalt pavement mixture producers and State Asphalt Pavement Associations (SAPA). Producers were asked primarily to provide company-/plant-level data, while SAPAs were asked to provide industry-level data for their State. In 2021, the supplemental survey was again fielded to gather information about the use of in-place recycling techniques.

Survey Methodology

To collect and analyze the data summarized in the main *Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage* report for the 2021 construction season survey, the following tasks were conducted:

1. Develop a survey instrument that enables an analysis of the quantities of recycled materials being used in asphalt mixtures, as well as the total amount of WMA produced nationally.
2. Conduct a voluntary survey of asphalt mix producers throughout the United States and follow up via telephone, email, and in-person requests for information in locations where responses were low.
3. Estimate the total asphalt mixture market in each State or territory by using data provided by SAPAs through the survey instrument and the U.S. Department of Transportation-aid highway apportionment to determine a weighting factor for each State and reconciling the total U.S. asphalt mix tonnage with national estimates.
4. Analyze and summarize the information nationally and in each State and to prepare a final report.

The survey was conducted using an online survey platform, SurveyMonkey®. Table A1 summarizes the questions asked in each section of the survey instrument. Sections 1 through 4 of the survey instrument remained consistent from the 2009 to 2014 construction seasons. Questions were added to or modified in Sections 2 through 4 for the 2015 to 2021 construction seasons to gather additional information about RAP and RAS stockpiling, fractionation, the use of softer binders and recycling agents, the acceptance of processed RAS, and the use of WMA technologies at HMA temperatures. In 2021, the Section 4 question on WMA production temperature reduction ranges was added to gather additional information. In 2017, the Section 3 question about tons of unprocessed shingles accepted was modified to ask about the type of unprocessed shingles accepted. In 2018, the Section 4 questions about the use of WMA additives at HMA temperatures were modified to gather additional information. Section 5 was added in the 2012 construction season survey to collect information on the use of other recycled material in asphalt mixtures. Starting in 2015, the Section 5 question asking about specific recycled materials was modified to replace one user-provided response with cellulose fiber. A copy of the survey used to gather information for the 2021 construction season is provided in the Survey Instrument section of Appendix A.

Producers were notified of the survey through several forums and electronic media. Notice were placed in NAPA's e-newsletter, *ActionNews*, informing members of the survey and asking for their participation. SAPAs solicited participation by placing notices on their websites and in their newsletters. Announcements were made at NAPA meetings, as well as at several State Asphalt Pavement Association conferences. A press release was sent to construction industry trade media and was published in print and online. Notices of the survey and links were also shared through social media channels, primarily Facebook, and LinkedIn. Follow up with producers and SAPAs was conducted via email, social media, and telephone.

Table A1: Survey Instrument Summary: Producer Questions, 2021

Section 1: General Information	Section 2: RAP	Section 3: RAS	Section 4: WMA	Section 5: Other Recycled Materials
Type of Survey Respondent	Tons RAP Accepted	Tons Unprocessed Tear-Off Shingles Accepted	Average % Produced for DOT Tons With ≥10°F Reduction	Other Recycled Materials Used (Y/N)
Contact Information	Tons Used in HMA/WMA Mixes	Tons Unprocessed Manufacturers' Waste Shingles Accepted	Average % Produced for Other Agency Tons With ≥10°F Reduction	Type of Other Recycled Materials Used (GTR, Steel Slag, Blast Furnace Slag, Cellulose Fiber, Up to Two User-Provided Responses)
State Information Is Provided for	Tons Used in Aggregate Base	Tons Processed Shingles Accepted	Average % Produced for Commercial & Residential Tons With ≥10°F reduction	Tons of HMA/WMA Produced Using Each Other Recycled Material
Number of Production Plants	Tons Used in Cold-Mix Asphalt	Tons Used in HMA/WMA Mixes	Average % Produced with 10°F - 30°F, 31°F - 50°F, ≥50°F reduction	Tons of Each Other Recycled Product Used
DOT Tons	Tons Used in Other	Tons Used in Aggregate Base	Chemical Admixture % With ≥10°F Reduction	
Other Agency Tons	Tons Landfilled	Tons Used in Cold-Mix Asphalt	Additive Foaming % With ≥10°F Reduction	
Commercial & Residential Tons	Average % for DOT Mixtures	Tons Used in Other	Production Plant Foaming % With ≥10°F Reduction	
	Average % for Other Agency Mixtures	Tons Landfilled	Organic Additive % With ≥10°F Reduction	
	Average % for Commercial & Residential Mixtures	Average % for DOT Mixtures	Average % Produced for DOT Tons at HMA Temperatures	
	Excess RAP (Y/N)	Average % for Other Agency Mixtures	Average % Produced for Other Agency Tons at HMA Temperatures	
	Tons of RAP Stockpiled	Average % for Commercial & Residential Mixtures	Average % Produced for Commercial & Residential Tons at HMA Temperatures	
	Percentage of RAP Fractionated	Excess RAS (Y/N)	Chemical Admixture % at HMA temperatures	
	Percentage of RAP Mixtures Using Softer Asphalt Binder	Tons of RAS Stockpiled	Additive Foaming % at HMA temperatures	
	Percentage of RAP Mixtures Using Recycling Agents	What Sectors Allow What Level of RAS	Plant Foaming % at HMA temperatures	
		Percentage of RAP Mixtures Using Softer Asphalt Binder	Organic Additive % at HMA temperatures	
		Percentage of RAP Mixtures Using Recycling Agents		

Asphalt mixture producers then went to the SurveyMonkey® website to complete the survey form. Because data was collected on a State-by-State basis, producers could complete the survey multiple times, providing information for operations in different States on each visit. Some producers submitted data through PDF versions of the survey instrument or through a Microsoft Excel spreadsheet developed by NAPA. After the initial data was gathered and analyzed, anomalies in individual producer records were identified and reconciled.

To collect industry-wide data from the SAPAs, the survey instrument included 7 questions focused on State-level information, as opposed to specific producer information. Table A2 summarizes these questions. In a handful of States without SAPAs, industry-wide data was provided by an Associated General Contractors (AGC) chapter or a similar knowledgeable source. Prior to 2018, this data was collected via a separate survey; starting in 2018, a single survey instrument was used with the first question ("Are you an Asphalt Producer, State Asphalt Pavement Association, or Other") determining whether the respondent should answer the producer or SAPA survey questions. Respondents indicating "Other" were not surveyed.

Table A2: Survey Instrument Summary: SAPA Questions, 2021

Section 1: General Information	Section 2: Tonnage	Section 3: RAP	Section 4: RAS	Section 5: Other Requirements
Type of Survey Respondent	Estimate of Total Tons Produced in State (All Sectors	Do Producers in State Fractionate RAP (Y/N)	What Sectors Allow What Level of RAS (DOT, Other Agency, Commercial & Residential)	Require, Allow, or Prohibit Use of Recycling Agents With RAP, RAS, RAP+RAS
Contact Information				
State Information Is Provided for				

Appendix B and certain tables in this report provide survey responses and estimated values at the State/territory level. To keep specific producer data confidential, no State-specific information is provided in the tables or appendixes if fewer than three producers from the State/territory responded to the survey. Information from States/territories with fewer than three responding companies is included in the estimated national values, however.

To gather information about the use of cold in-place recycling, hot in-place recycling, cold central plant recycling, and full-depth reclamation techniques, a supplemental survey was developed in 2019. All respondents to the main survey were asked to complete the supplemental survey if their company provided any in-place recycling or cold central plant recycling services. In addition to promoting the supplemental survey using the same channels as the main survey, NAPA worked with the Asphalt Recycling & Reclaiming Association (ARRA) to promote participation among its membership.

The supplemental survey was conducted using an online survey platform, SurveyMonkey®. Table A3 summarizes the six questions asked in the two sections of the survey instrument. A copy of the supplemental survey is also provided in the Survey Instrument section of Appendix A. Respondents were asked to complete separate copies of the survey for each State in which they operated. Because different units of measurement may be used for each in-place recycling technology, respondents were asked to provide either a quantity or the volume unit of measure, for example tons, metric tonnes, cubic yards, square yards at inches of thickness, and so forth.

Table A3: Survey Instrument Summary: Supplemental Survey on In-Place Recycling Questions, 2021

Section 1: General Information	Section 2: Total Quantities
Contact Information	Hot In-Place Recycling (HIR)
State Information Is Provided for	Cold Central Plant Recycling (CCPR)
	Cold In-Place Recycling (CIR)
	Full-Depth Reclamation (FDR)

Data Estimation Method

To determine the estimated total amount of RAP and RAS used and WMA produced nationwide and in each State/territory, the total amount of asphalt mix produced in each State/territory needed to be determined. Total tonnage of asphalt mix produced represents both commercial (i.e., private sector) and governmental (i.e., DOT and Other Agency) tonnages. Estimated tonnages were provided by SAPAs for 25 States, totaling more than 250 million tons.

To estimate the total tons in States where a SAPA estimate of total tonnage was not available, a linear relationship based on an examination of the relationship between SAPA-estimated tons and FY2021 Federal-aid highway apportionment (FHWA, 2022) for those States was determined, resulting in Equation A1. This is the same methodology used to estimate tonnage in previous versions of this survey, as detailed in Hansen & Newcomb (2011), with the formula updated annually as SAPA-reported estimates and Federal apportionments for the States change.

$$\text{Total Estimated Tons} = [0.0119 \times (\text{State Federal Apportionment})] - 291{,}562 \qquad [A1]$$

As shown in Figure A1, 42 States and territories, along with multiple counties and municipalities across the Nation, have acted to raise and/or otherwise dedicate additional local funds to transportation since 2012 (T4America, n.d.; Davis, 2019; NCSL, 2021). These additional and/or dedicated funds are not accounted for in Equation A1, which can lead to underestimation of total tonnage in some States. Similarly, because Federal funding for the U.S. territories is through the Territorial and Puerto Rico Highway Program instead of State apportionment, estimates for these jurisdictions were calculated using Territorial and Puerto Rico Highway Program FY2021 funding levels (FHWA, 2022).

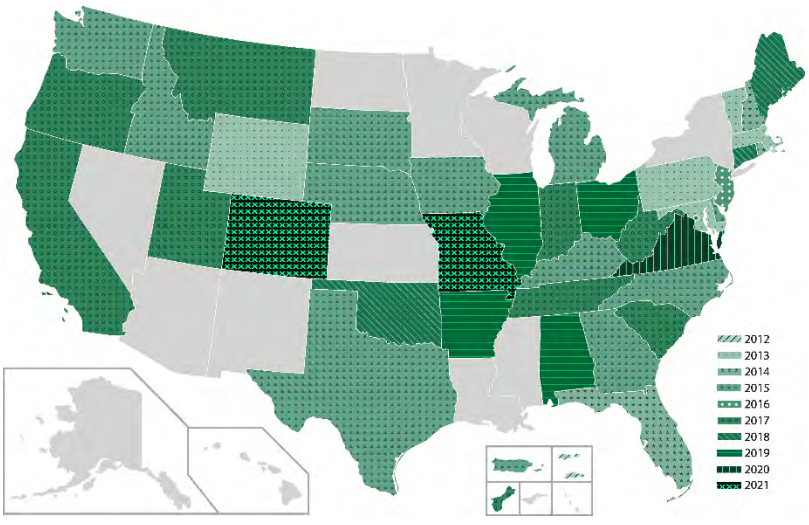


Figure A1: States Approving Measures to Increase and/or Dedicate Transportation Funding, 2012–2021

In addition, in some markets, asphalt pavement mixture may be produced in one State and placed in a neighboring State. Although producers are asked to report tonnage based upon the location where it is placed, it is possible that

data about mixtures reported for one State may include data from mixtures placed in two or more States. This can lead to overreporting in one State and underreporting in another. For example, a producer in Washington, D.C., may have produced mixtures used in Virginia and Maryland too, but may report all tons produced as Washington, D.C., tonnage.

These caveats apply to the data reported in Appendix B and other State-level data included in this report; however, they have only minimal impact on the national values in the main report.

Survey Instrument

As outlined earlier, this appendix includes a copy of the survey instruments used to collect responses from participants. The majority of asphalt mixture producers participating in the survey used the online survey platform SurveyMonkey® to provide their responses. Some producers submitted their data through PDF forms or a Microsoft Excel spreadsheet developed by NAPA to collect the same information. The producer section of the survey instrument begins on page 7; the SAPA section begins on page 24. The supplemental survey begins on page 28.

References

Davis, C. (2019). Most States Have Raised Gas Taxes in Recent Years. *JustTaxes Blog*. Institute on Taxation and Economic Policy, Washington, D.C. https://itep.org/most-states-have-raised-gas-taxes-in-recent-years-0419/ [Retrieved July 19, 2019]

FHWA (2022). Bipartisan Infrastructure Law Fact Sheet: Territorial and Puerto Rico Program [web page]. Federal Highway Administration, Washington, D.C. https://www.fhwa.dot.gov/bipartisan-infrastructure-law/territorial_puerto_rico_hp_fact_sheet.cfm [Accessed 1 November 2022]

FHWA (2022). FAST ACT Funding Tables: Chapter 11, Table FA-4: Summary of Apportionments Authorized for Fiscal Year (FY) 2021 [web page]. Federal Highway Administration, Washington, D.C. https://www.fhwa.dot.gov/policyinformation/statistics/2021 [Draft table emailed 14 November 2022]

Hansen, K.R., & D.E. Newcomb (2011). *Asphalt Pavement Mix Production Survey: Reclaimed Asphalt Pavement, Reclaimed Asphalt Shingles, Warm-Mix Asphalt Usage: 2009–2010* (IS 138). National Asphalt Pavement Association, Lanham, Maryland.

NCSL (2022). Recent Legislative Actions Likely to Change Gas Taxes [web page]. National Conference of State Legislatures, Washington, D.C. http://www.ncsl.org/research/transportation/2013-and-2014-legislative-actions-likely-to-change-gas-taxes.aspx [Accessed 1 November 2022]

T4America (n.d.). State Transportation Funding [web page]. Transportation for America, Washington, D.C. http://t4america.org/maps-tools/state-transportation-funding/ [Accessed 31 May 2019]

Williams, B.A., J.R. Willis, & Shacat, J. (2022). *Annual Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2021, 12th Annual Survey* (IS 138). National Asphalt Pavement Association, Greenbelt, Maryland.

2021 Construction Season Survey Instrument – Producer Section

Purpose

The National Asphalt Pavement Association is working with the Federal Highway Administration to determine the amount of hot-mix asphalt (HMA), warm-mix asphalt (WMA), and recycled materials being produced and used in each state. This survey will be used to collect this data.

It is important for the industry that you complete this survey so that we have accurate information regarding the use of recycled materials and WMA and to identify areas needing assistance in implementation.

DATA FROM THIS SURVEY WILL BE CONFIDENTIAL AND WILL BE USED ONLY FOR THE PURPOSES OF DETERMINING THESE QUANTITIES. IT WILL NOT BE USED FOR ANY OTHER PURPOSE. DATA WILL BE REPORTED BY STATE ONLY, AND NO STATE-SPECIFIC DATA WILL BE REPORTED WHEN FEWER THAN THREE COMPANIES/BRANCHES RESPOND WITHIN A STATE, **NO COMPANY-SPECIFIC INFORMATION WILL BE DISCLOSED IN ANY WAY.**

Survey results will be shared with industry, government agencies, and officials to help in the implementation of recycling and warm-mix technologies. The data collected from this survey provides insight into trends, current practice, and is utilized to highlight the sustainability of asphalt mixtures. These results are also used by FHWA, Energy Information Administration, Environmental Protection Agency, and other federal, state, and local agencies to determine the impact of recycled materials and WMA.

By completing this survey you will be eligible to receive a complimentary copy of the full report.

Your participation is greatly appreciated.

*** 1. Are you a...**

- o Asphalt Producer
- o State Asphalt Pavement Association (or similar)
- o Other

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Industry Contact Information

It is recommended that you print a copy of the full survey — **download a PDF** — to make sure you have the necessary data at hand before beginning the online survey.

Companies with multi-state operations are encouraged to **download a spreadsheet** to report their data. Please return the completed spreadsheet to Brett Williams, NAPA Director of Engineering & Technical Support, at bwilliams@asphaltpavement.org.

The following information will be used only to confirm that we do not get duplicate information from a company and to contact you if we have any questions regarding your answers. Contact Brett Williams at bwilliams@asphaltpavement.org or NAPA by phone at 888-468-6499 if you have any questions.

* **2. Company/Branch Name:**

* **3. Contact Person's Name & Address**

* **4. Contact Person's Email**

* **5. Contact Person's Phone Number**

NATIONAL ASPHALT PAVEMENT ASSOCIATION

State

Please select the state for which you are providing the information.

If your branch operates in more than one state, please complete a separate questionnaire for each state. If a plant provides mix for more than one state, please divide the tonnage accordingly, using your best estimate if specific data is not available.

* **6. Which state is the information provided for?**

- o Alabama
- o Alaska
- o American Samoa
- o Arizona
- o Arkansas
- o California
- o Colorado
- o Connecticut
- o Delaware
- o District of Columbia
- o Florida
- o Georgia
- o Guam
- o Hawaii
- o Idaho
- o Illinois
- o Indiana
- o Iowa
- o Kansas
- o Kentucky
- o Louisiana
- o Maine
- o Maryland
- o Massachusetts
- o Michigan
- o Minnesota
- o Mississippi
- o Missouri
- o Montana
- o Nebraska
- o Nevada
- o New Hampshire
- o New Jersey
- o New Mexico
- o New York
- o North Carolina
- o North Dakota
- o Northern Mariana Islands
- o Ohio
- o Oklahoma
- o Oregon
- o Pennsylvania
- o Puerto Rico
- o Rhode Island
- o South Carolina
- o South Dakota
- o Tennessee
- o Texas
- o US Virgin Islands
- o Utah
- o Vermont
- o Virginia
- o Washington
- o West Virginia
- o Wisconsin
- o Wyoming

* **7. How many plants does this survey response cover?**

Number of plants

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Total Asphalt Tonnage for 2021

Please complete the following information for the total tonnage of all asphalt production in 2021.

*** 8. What was your total tonnage of asphalt mixes in 2021 for the following sectors? (Use best estimate if data is not available.)**

State DOT:

Other Agency (City, County, FAA, Military, Toll Authorities)

Commercial & Residential

NATIONAL ASPHALT PAVEMENT ASSOCIATION

RAP Supply and Use 2021

Please complete the following information on the amount of RAP received and used for 2021.

* **9. Did you accept, process, or use RAP in the state during 2021?**

- o Yes
- o No

NATIONAL ASPHALT PAVEMENT ASSOCIATION

RAP Supply and Use 2021

Please complete the following information regarding the amount of RAP received and used for 2021.

*** 10. How many tons of reclaimed asphalt pavement and asphalt millings were accepted/delivered to your facilities in the state in 2021?**

Tons:

*** 11. How many tons of RAP were used in 2021 for the following purposes? (Use best estimate if data not available.)**

Recycled Back into HMA/WMA Mixes:

Aggregate Base:

Cold Mix:

Other:

Landfilled:

*** 12. What was the average RAP percentage used in asphalt mixes during 2021 for the following sectors? (Use best estimate if data not available.)**

State DOT:

Other Agency (City, County, FAA, Military, Toll Authorities)

Commercial & Residential

NATIONAL ASPHALT PAVEMENT ASSOCIATION

RAP Supply and Use 2021

* **13. At the end of the year 2021 did you have excess RAP (processed or unprocessed) in inventory?**

  - o Yes
  - o No

* **14. Please estimate how many tons of RAP you had stockpiled at the end of 2021. (Use best estimate if data not available.)**

* **15. What percentage of the RAP processed is fractionated into two or more sizes? (Use best estimate if data not available.)**

* **16. What percent of mixes using RAP were produced using a softer grade of asphalt binder? (Use best estimate if data not available.)**

* **17. What percent of mixes using RAP were produced using recycling agents? (Use best estimate if data not available.)**

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Reclaimed Asphalt Shingles (RAS) Supply and Use for 2021

* **18. Did you accept waste shingles and/or process or use reclaimed asphalt shingles (RAS) in 2021?**

- o Yes
- o No

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Reclaimed Asphalt Shingles (RAS) Supply and Use for 2021

Please complete the following information regarding the amount of waste shingles received (processed and unprocessed) and used during 2021.

* 1**9. How many tons of shingles were accepted/delivered to your facilities in the state in 2021?**

Unprocessed Tear-off Shingles:

Unprocessed Manufacturers' Waste Shingles:

Processed Shingles:

* **20. How many tons of reclaimed asphalt shingles (RAS) were used for the following purposes in 2021? (Use best estimate if data not available.)**

Recycled into HMA/WMA Mixes:

Aggregate Base:

Cold Mix:

Other:

Landfilled:

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Reclaimed Asphalt Shingles (RAS) Supply and Use for 2021

*** 21. What was average RAS percentage used in asphalt mixes in 2021 for the following sectors? (Use best estimate if data not available.)**

State DOT:

Other Agency (City, County, FAA, Military, Toll Authorities):

Commercial & Residential:

*** 22. At the end of the year 2021 did you have any surplus RAS stockpiled? (Include processed and unprocessed shingles.)**

- o Yes
- o No

*** 23. Please estimate how many tons of RAS you had stockpiled at the end of 2021. (Use best estimate if data not available.)**

*** 24. Is RAS allowed in**

	ALL	SOME	NONE
DOT mixes	O	O	O
Other Agency mixes	O	O	O
Commercial and Residential mixes	O	O	O

*** 25. What percent of mixes using RAS were produced using a softer grade of asphalt binder? (Use best estimate if data not available.)**

*** 26. Please estimate how many tons of RAS you had stockpiled at the end of 2021. (Use best estimate if data not available.)**

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Warm-Mix Asphalt Production for 2021

Warm-mix asphalt is the generic term for a variety of technologies that allow the producers of asphalt pavement material to lower the temperatures at which the material is mixed and placed on the road by at least 10°F. The survey will collect data for warm-mix technologies used at reduced temperature and at hot mix temperatures separately.

* **27. Did any of your plants in this state use warm-mix asphalt technologies in 2021?**

- o Yes
- o No

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Warm-Mix Asphalt Production for 2021

Warm-mix asphalt is the generic term for a variety of technologies that allow the producers of asphalt pavement material to lower the temperatures at which the material is mixed and placed on the road by at least 10°F.

*** 28. What was average percent of mix tons produced using warm-mix asphalt technologies in 2021 for the different sectors? (Use best estimate if data not available.)**

State DOT:

Other Agency (City, County, FAA, Military, Toll Authorities):

Commercial & Residential:

*** 29. Please estimate the percentage of the total warm-mix asphalt (WMA) that was produced in the following ranges of temperature reduction: (Use best estimate if data is not available, entries should total 100%)**

10°F – 30°F	
31°F – 50°F	
51°F or more of temp. reduction	

*** 30. What percentage of the total warm-mix asphalt (WMA) for 2021 was produced using the following technologies? (Use best estimate if data not available, entries should total 100%)**

Chemical Admixture	
Additive (Zeolite) Foaming	
Plant Foaming	
Organic (Wax) Additive	
Blend	
* Please specify the Blend:	

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Warm-Mix Asphalt Production for 2021

*** 31. What was average percent of mix tons using warm-mix technologies for mixes produced at hot-mix temperatures (i.e., without lowering temperatures by at least 10°F.)**

State DOT:

Other Agency (City, County, FAA, Military, Toll Authorities):

Commercial & Residential:

*** 32. What percentage of the total warm-mix asphalt (WMA) produced at hot mix temperatures (i.e., without lowering temperatures by at least 10°F.) for 2021 was produced using the following technologies? (Use best estimate if data not available, entries should total 100%)**

Chemical Admixture	
Additive (Zeolite) Foaming	
Plant Foaming	
Organic (Wax) Additive	
Blend	
* Please specify the Blend:	

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Other Recycled Material for 2021

Please let us know if you used any other recycled materials in HMA/WMA mixes in 2021.

* **33. Did you use other recycled materials (excluding RAP and RAS) in your mixes in 2021?**

(This includes materials added to the mix such as: ground tire rubber, blast furnace slag, steel slag, boiler slag, fly ash, bottom ash, foundry sand, other coal combustion products, glass, cellulose fibers, etc.)

- o Yes
- o No

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Other Recycled Material for 2021

*** 34. What other recycled material (excluding RAP and RAS) did you use in your mixes in 2021?**

	ALL	SOME	NONE
Ground Tire Rubber	O	O	O
Steel Slag	O	O	O
Blast Furnace Slag	O	O	O
Recycled Cellulose Fibers	O	O	O
Other 1*	O	O	O
Other 2*	O	O	O

* Please describe the other recycled materials used.

*** 35. How many tons of HMA/WMA was produced using this product? (Use best estimate if data not available.)**

Ground Tire Rubber

Steel Slag

Blast Furnace Slag

Recycled Cellulose

Other 1

Other 2

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Other Recycled Material for 2021

*** 36. How many tons of the recycled product was used in 2021? (Enter 0 if you do not have a reasonable estimate of this quantity)**

Ground Tire Rubber	
Steel Slag	
Blast Furnace Slag	
Recycled Cellulose	
Other 1	
Other 2	

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Thank You

* **37. Would you like a complimentary copy of the final report?**

- o Yes
- o No

If your company provides any of the following services: CIR, HIR, CCPR, or FDR, we ask that you to fill out a very short survey providing quantities of these activities in 2021. The link to the survey is here: https://www.surveymonkey.com/r/2021_IPR_Survey Thank you for your time in helping document some of the asphalt industries efforts in sustainability and recycling.

NATIONAL ASPHALT PAVEMENT ASSOCIATION

SAPA Contact Information

This survey is intended to collect information from State Asphalt Pavement Associations or similar associations. Please answer the following questions by May 1, 2022, to assist NAPA in preparing the 2021 Recycled Materials and WMA Survey. The additional information you provide us on RAP and RAS will enhance the information we provide in the survey report. Contact Brett Williams at bwilliams@asphaltpavement.org or NAPA by phone at 888-468-6499 if you have any questions.

*** 38. Association Name:**

Contact

*** 39. Name:**

NATIONAL ASPHALT PAVEMENT ASSOCIATION

SAPA Information

*** 40. Which state is the information provided for?**

- o Alabama
- o Alaska
- o American Samoa
- o Arizona
- o Arkansas
- o California
- o Colorado
- o Connecticut
- o Delaware
- o District of Columbia
- o Florida
- o Georgia
- o Guam
- o Hawaii
- o Idaho
- o Illinois
- o Indiana
- o Iowa
- o Kansas
- o Kentucky
- o Louisiana
- o Maine
- o Maryland
- o Massachusetts
- o Michigan
- o Minnesota
- o Mississippi
- o Missouri
- o Montana
- o Nebraska
- o Nevada
- o New Hampshire
- o New Jersey
- o New Mexico
- o New York
- o North Carolina
- o North Dakota
- o Northern Mariana Islands
- o Ohio
- o Oklahoma
- o Oregon
- o Pennsylvania
- o Puerto Rico
- o Rhode Island
- o South Carolina
- o South Dakota
- o Tennessee
- o Texas
- o US Virgin Islands
- o Utah
- o Vermont
- o Virginia
- o Washington
- o West Virginia
- o Wisconsin
- o Wyoming

*** 41. What is your best estimate of the total tons of asphalt mixture placed in your state in 2021? (This includes asphalt mixture tonnage for all sectors, ex. DOT, Other Agencies, Commercial & Residential) [2020 Estimates are provided below for your reference.]**

NATIONAL ASPHALT PAVEMENT ASSOCIATION

SAPA Information

Table 3: Summary of 2020 Estimated and Reported Asphalt Mixture Tons in Each State

State	Tons, Millions		Reported % of Estimated	State	Tons, Millions		Reported % of Estimated
	Estimated	Reported			Estimated	Reported	
Alabama	7.0	2.5	36%	Montana	4.1	*	*
Alaska	5.1	*	*	Nebraska	3.0	0.4	13%
American Samoa	0.02	NCR	NCR	Nevada	3.5	1.2	34%
Arizona	7.4	4.2	57%	New Hampshire	1.6	1.1	69%
Arkansas	6.0	2.9	48%	New Jersey	9.8	4.8	49%
California	25.4	12.2	48%	New Mexico	3.8	*	*
Colorado	9.0	4.9	54%	New York	17.5	5.6	32%
Connecticut	4.9	*	*	North Carolina	12.0	9.9	83%
Delaware	1.3	*	*	North Dakota	2.5	*	*
District of Columbia	1.2	*	*	No. Mariana Isl.	0.02	NCR	NCR
Florida	16.8	11.2	67%	Ohio	18.0	11.8	66%
Georgia	13.6	7.4	54%	Oklahoma	5.1	3.8	75%
Guam	0.1	NCR	NCR	Oregon	5.2	2.1	40%
Hawaii	0.8	*	*	Pennsylvania	17.8	5.9	33%
Idaho	2.9	1.2	41%	Puerto Rico	1.4	NCR	NCR
Illinois	14.4	8.4	58%	Rhode Island	2.2	*	*
Indiana	13.0	7.5	58%	South Carolina	7.0	3.2	46%
Iowa	5.2	1.9	37%	South Dakota	2.9	*	*
Kansas	3.5	2.4	69%	Tennessee	8.9	3.8	43%
Kentucky	4.0	1.7	43%	Texas	35.0	5.2	15%
Louisiana	7.5	1.1	15%	U.S. Virgin Isl.	0.1	NCR	NCR
Maine	2.7	2.7	99%	Utah	4.3	3.8	88%
Maryland	6.3	4.6	73%	Vermont	2.0	*	*
Massachusetts	6.5	2.9	45%	Virginia	10.5	7.3	70%
Michigan	14.8	10.0	68%	Washington	5.3	5.0	94%
Minnesota	12.2	7.3	60%	West Virginia	3.8	0.3	8%
Mississippi	4.3	4.2	98%	Wisconsin	12.0	9.6	80%
Missouri	10.2	2.4	24%	Wyoming	2.3	*	*
				Total	407.8	194.0†	48%

No Companies Responding

Fewer than 3 Companies Reporting

Total Reported Tons includes values from state with fewer than 3 Companies Reporting

SAPA Estimated Tons

Numbers do not add up exactly due to rounding

NATIONAL ASPHALT PAVEMENT ASSOCIATION

SAPA Information

*** 42. Tonnage Estimate Comments**

*** 43. Do producers in your state fractionate RAP?**

- o Yes
- o No

*** 44. Is RAS allowed in**

	ALL	SOME	NONE
DOT mixes	o	o	o
Other Agency mixes	o	o	o
Commercial and Residential mixes	o	o	o

Comments:

*** 45. Does your state require, allow, or prohibit the use of recycling agents or softer binders in high Asphalt Binder Replacement mixtures? (RAP, RAS, RAP & RAS)?**

	Require	Allow	Prohibit
Recycling Agent	o	o	o
Softer Binders	o	o	o

Comments:

2021 In-Place Recycling Supplemental Survey Instrument

Purpose

The National Asphalt Pavement Association is working with the Federal Highway Administration to determine the amount of recycled materials being utilized for in-place recycling (Cold-In-Place, Hot In-Place, Cold Central Plant Recycling, and Full-Depth Reclamation). This survey will be used to collect this data.

It is important for the industry that you complete this survey so that we have accurate information regarding the use of recycled materials and to identify areas needing assistance in implementation.

DATA FROM THIS SURVEY WILL BE CONFIDENTIAL AND WILL BE USED ONLY FOR THE PURPOSES OF DETERMINING THESE QUANTITIES. IT WILL NOT BE USED FOR ANY OTHER PURPOSE. DATA WILL BE REPORTED REGIONALLY, AND NO REGIONAL DATA WILL BE REPORTED WHEN FEWER THAN THREE COMPANIES/BRANCHES RESPOND, NO COMPANY-SPECIFIC INFORMATION WILL BE DISCLOSED IN ANY WAY.

Survey results will help the industry, government agencies, and officials with the continued implementation of recycling. The data collected from this survey provides insight into trends, current practice, and is utilized to highlight the sustainability of asphalt mixtures. These results are also used by FHWA, Energy Information Administration, Environmental Protection Agency, and other federal, state, and local agencies to determine the impact of recycled materials.

By completing this survey you will be eligible to receive a complimentary copy of the full report.

Your participation is greatly appreciated.

NATIONAL ASPHALT PAVEMENT ASSOCIATION

ARRA™

Responsible Renewal. Reliable Results.

Industry Contact Information

Companies with multi-state operations will need to fill in the survey for each state.

The following information will be used only to confirm that we do not get duplicate information from a company and to contact you if we have any questions regarding your answers. Contact Brett Williams at bwilliams@asphaltpavement.org or NAPA by phone at 888-468-6499 if you have any questions.

* **1. Company/Branch Name:**

* **2. Contact Person's Name & Address**

* **3. Contact Person's Email**

* **4. Contact Person's Phone Number**

State

* **5. Which state is the information provided for?**

- o Alabama
- o Alaska
- o American Samoa
- o Arizona
- o Arkansas
- o California
- o Colorado
- o Connecticut
- o Delaware
- o District of Columbia
- o Florida
- o Georgia
- o Guam
- o Hawaii
- o Idaho
- o Illinois
- o Indiana
- o Iowa
- o Kansas
- o Kentucky
- o Louisiana
- o Maine
- o Maryland
- o Massachusetts
- o Michigan
- o Minnesota
- o Mississippi
- o Missouri
- o Montana
- o Nebraska
- o Nevada
- o New Hampshire
- o New Jersey
- o New Mexico
- o New York
- o North Carolina
- o North Dakota
- o Northern Mariana Islands
- o Ohio
- o Oklahoma
- o Oregon
- o Pennsylvania
- o Puerto Rico
- o Rhode Island
- o South Carolina
- o South Dakota
- o Tennessee
- o Texas
- o US Virgin Islands
- o Utah
- o Vermont
- o Virginia
- o Washington
- o West Virginia
- o Wisconsin
- o Wyoming

NATIONAL ASPHALT PAVEMENT ASSOCIATION

ARRA™

Responsible Renewal. Reliable Results.

Total Quantities for 2021

Please complete the following information for the total quantities of all CIR, HIR, CCPR, and FDR in 2021.

*** 6. What was your state-wide total quantity of in-place recycling in 2021? (Use best estimate if exact data is not available. Please provide the units in your answer, either weight or volume can be submitted, so examples of units could be Tons, Metric Tons, Cubic Yards, Square Yards @ inches of thickness, and the list goes on...)**

Hot In-Place Recycling (HIR):

Cold Central Plant Recycling (CCPR)

Cold In-Place Recycling (CIR)

Full-Depth Reclamation (FDR)

Thank You

* **7. Would you like a complimentary copy of the final report?**

- o Yes
- o No

National Asphalt Pavement Association
6406 Ivy Lane, Suite 350
Greenbelt, Maryland 20770-1441
www.AsphaltPavement.org
napa@AsphaltPavement.org
Toll Free: 888-468-6499
Tel: 301-731-4748
Fax: 301-731-4621

Publications
Login at https://member.asphaltpavement.org/Shop/Product-Catalog

12th Annual Asphalt Pavement Industry Survey
IS 138 — Appendix A

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Asphalt Pavement Industry Survey on

Recycled Materials and Warm-Mix Asphalt Usage 2021

IS-138 Appendix B:
State-by-State Use of
Recycled Materials and Warm-Mix Asphalt
In Asphalt Pavement Mixtures

12th Annual Survey

Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2021 Appendix B

Introduction

Appendix B provides a State-by-State breakdown of data reported in the *Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage* report for the 2021 construction season survey (Williams et al., 2022), including information from Tables 5, 6, 7, 8, 11, 12 and 15. **The accuracy of the State-level data and estimates will vary depending upon the number of companies participating in the survey in a given State and the tonnage produced by each respondent.** Appendix A outlines the methodology used to collect data and to generate estimates.

Appendix B reports data for all 50 U.S. States, as well as the District of Columbia and the five U.S. territories. In instances where fewer than three companies in a State/territory responded to the survey, only estimated total tonnages are reported to protect proprietary company data. Table 1 in the main report, republished below, summarizes the number of respondents from each State and territory. A total of 261 companies representing 1,388 production plants responded to the 2021 construction season survey. Branches, subsidiaries, and operating units are counted as unique companies in Table 1 and throughout the report. Throughout the tables, where percentages and totals are calculated, the numbers may not add up exactly due to rounding.

A degree of fluctuation in year-to-year comparisons of data is influenced by which companies responded to the 2021 construction season survey versus prior-year survey respondents. Approximately 84 percent of 2020 responding companies participated in the 2021 survey, too. Additional factors influencing the reliability of State-level data in this appendix are explained in the Data Estimation Method section of Appendix A.

Table 1: Number of Companies Completing 2021 Construction Season Survey in Each State/Territory

State	Cos.	Prod. Plants	State	Cos.	Prod. Plants	State	Cos.	Prod. Plants
Alabama	7	49	Kentucky	7	42	Ohio	9	89
Alaska	*	*	Louisiana	3	9	Oklahoma	10	43
American Samoa	NCR	NCR	Maine	6	25	Oregon	4	12
Arizona	3	22	Maryland	9	18	Pennsylvania	8	42
Arkansas	7	24	Massachusetts	6	12	Puerto Rico	NCR	NCR
California	4	41	Michigan	7	46	Rhode Island	*	*
Colorado	6	22	Minnesota	6	41	South Carolina	10	46
Connecticut	*	*	Mississippi	5	25	South Dakota	*	*
Delaware	*	*	Missouri	4	17	Tennessee	9	53
District of Columbia	*	*	Montana	*	*	Texas	6	66
Florida	5	37	Nebraska	*	*	U.S. Virgin Islands	NCR	NCR
Georgia	5	47	Nevada	4	7	Utah	7	17
Guam	NCR	NCR	New Hampshire	3	15	Vermont	*	*
Hawaii	3	10	New Jersey	3	17	Virginia	10	39
Idaho	5	19	New Mexico	*	*	Washington	7	36
Illinois	18	51	New York	9	49	West Virginia	3	15
Indiana	6	55	North Carolina	9	84	Wisconsin	3	67
Iowa	5	14	North Dakota	*	*	Wyoming	*	*
Kansas	3	19	No. Mariana Islands	NCR	NCR	**Total†**	261	1388

NCR = No companies responding
* = Fewer than 3 companies reporting
† = Total includes companies/production plants from States with fewer than 3 companies reporting.

ALABAMA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	2.5	5.5	7.0	7.0
	DOT	1.4	3.5	3.9	4.4
	Other Agency	0.5	1.1	1.4	1.5
	Commercial & Residential	0.6	0.9	1.7	1.1
	No. of Companies Reporting	4	7		
RAP (Tons, Millions)	Accepted	0.5	1.4	1.5	1.8
	Used in HMA/WMA Mixtures	0.6	1.4	1.7	1.8
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.76	1.26	2.13	1.62
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	23.3%	24.7%		
	Average % for Other Agency Mixtures[1]	24.3%	25.0%		
	Average % for Commercial & Residential Mixtures[1]	25.3%	26.8%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			24.3%	25.7%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	35%	35%		
	% of RAP Mixtures Using Softer Binders	1%	0%		
	% of RAP Mixtures Using Recycling Agents	8%	17%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	1.0	0.0	1.3
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	5.0	0.0	6.4
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	5.0	0.0	6.4
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.06%		
	Average % for Other Agency Mixtures[1]	0.00%	0.10%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.10%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.09%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	14%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	100%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.0 (Tons, Millions)	1.2 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			2.3 (Tons, Millions)	0.5 (Tons, Millions)
	DOT	28%	18%	1.1 (Tons, Millions)	0.8 (Tons, Millions)
	Other Agency	30%	40%	0.4 (Tons, Millions)	0.6 (Tons, Millions)
	Commercial & Residential	48%	28%	0.8 (Tons, Millions)	0.3 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	4%	48%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	96%	52%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	25%	29%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

ALASKA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	5.1	5.5
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

AMERICAN SAMOA

Material	Sectors	Reported Values		Estimated Values	
		2020	2020	2020	2021
HMA/WMA (Tons, Millions)	Total	NCR	NCR	0.02	0.02
	DOT	NCR	NCR	NCR	NCR
	Other Agency	NCR	NCR	NCR	NCR
	Commercial & Residential	NCR	NCR	NCR	NCR
	No. of Companies Reporting	NCR	NCR		
RAP (Tons, Millions)	Accepted	NCR	NCR	NCR	NCR
	Used in HMA/WMA Mixtures	NCR	NCR	NCR	NCR
	Used as Aggregate	NCR	NCR	NCR	NCR
	Used in Cold-Mix Asphalt	NCR	NCR	NCR	NCR
	Used in Other	NCR	NCR	NCR	NCR
	Landfilled	NCR	NCR	NCR	NCR
	Total Tons of RAP Stockpiled at Year-End	NCR	NCR	NCR	NCR
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	NCR	NCR		
	Average % for Other Agency Mixtures[1]	NCR	NCR		
	Average % for Commercial & Residential Mixtures[1]	NCR	NCR		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			NCR	NCR
RAP (Other Reported Data)	% Companies Reporting Using RAP	NCR	NCR		
	% of RAP Fractionated	NCR	NCR		
	% of RAP Mixtures Using Softer Binders	NCR	NCR		
	% of RAP Mixtures Using Recycling Agents	NCR	NCR		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	NCR	NCR	NCR	NCR
	Processed Shingles Accepted	NCR	NCR	NCR	NCR
	Used in HMA/WMA Mixtures	NCR	NCR	NCR	NCR
	Used as Aggregate	NCR	NCR	NCR	NCR
	Used in Cold-Mix Asphalt	NCR	NCR	NCR	NCR
	Used in Other	NCR	NCR	NCR	NCR
	Landfilled	NCR	NCR	NCR	NCR
	Total Tons of RAS Stockpiled at Year-End	NCR	NCR	NCR	NCR
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	NCR	NCR		
	Average % for Other Agency Mixtures[1]	NCR	NCR		
	Average % for Commercial & Residential Mixtures[1]	NCR	NCR		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			NCR	NCR
RAS (Other Reported Data)	% Companies Reporting Using RAS	NCR	NCR		
	% of RAS Mixtures Using Softer Binders	NCR	NCR		
	% of RAS Mixtures Using Recycling Agents	NCR	NCR		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			NCR	NCR
	Total Tons Produced With WMA Technology at HMA Temperatures			NCR	NCR
	DOT	NCR	NCR	NCR	NCR
	Other Agency	NCR	NCR	NCR	NCR
	Commercial & Residential	NCR	NCR	NCR	NCR
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	NCR	NCR		
	Additive Foaming, % of Market	NCR	NCR		
	Plant Foaming, % of Market	NCR	NCR		
	Organic Additive, % of Market	NCR	NCR		
	% Companies Reporting Using WMA Technologies	NCR	NCR		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

ARIZONA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	4.2	3.2	7.4	7.9
	DOT	0.5	0.2	0.9	0.5
	Other Agency	1.6	2.1	2.8	5.2
	Commercial & Residential	2.1	0.9	3.7	2.2
	No. of Companies Reporting	4	3		
RAP (Tons, Millions)	Accepted	0.4	0.1	0.7	0.2
	Used in HMA/WMA Mixtures	0.3	0.1	0.5	0.3
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.58	0.87	1.02	2.13
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	9.3%	3.0%		
	Average % for Other Agency Mixtures[1]	5.0%	5.1%		
	Average % for Commercial & Residential Mixtures[1]	10.7%	11.6%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			6.9%	4.4%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	13%	0%		
	% of RAP Mixtures Using Softer Binders	15%	40%		
	% of RAP Mixtures Using Recycling Agents	16%	33%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.2 (Tons, Millions)	0.1 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.9 (Tons, Millions)	0.3 (Tons, Millions)
	DOT	0%	1%	0.0 (Tons, Millions)	0.0 (Tons, Millions)
	Other Agency	70%	3%	2.0 (Tons, Millions)	0.2 (Tons, Millions)
	Commercial & Residential	4%	10%	0.1 (Tons, Millions)	0.2 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	56%	100%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	0%		
	Organic Additive, % of Market	44%	0%		
	% Companies Reporting Using WMA Technologies	100%	67%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

ARKANSAS

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	2.9	2.8	6.0	6.0
	DOT	1.8	1.8	3.7	4.0
	Other Agency	0.6	0.5	1.2	1.0
	Commercial & Residential	0.5	0.5	1.0	1.0
	No. of Companies Reporting	6	7		
RAP (Tons, Millions)	Accepted	0.4	0.2	0.9	0.4
	Used in HMA/WMA Mixtures	0.4	0.3	0.8	0.6
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.45	0.32	0.93	0.70
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	14.8%	10.9%		
	Average % for Other Agency Mixtures[1]	13.6%	8.2%		
	Average % for Commercial & Residential Mixtures[1]	10.5%	12.2%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			13.8%	10.7%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	37%	16%		
	% of RAP Mixtures Using Softer Binders	0%	11%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	8.9	15.0	18.5	32.6
	Used in HMA/WMA Mixtures	6.0	12.1	12.3	26.4
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	4.7	17.2	9.6	37.5
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.21%	0.44%		
	Average % for Other Agency Mixtures[1]	0.21%	0.44%		
	Average % for Commercial & Residential Mixtures[1]	0.21%	0.44%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.21%	0.44%
RAS (Other Reported Data)	% Companies Reporting Using RAS	17%	29%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			2.6 (Tons, Millions)	0.7 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.2 (Tons, Millions)	1.0 (Tons, Millions)
	DOT	66%	31%	2.5 (Tons, Millions)	1.2 (Tons, Millions)
	Other Agency	55%	33%	0.7 (Tons, Millions)	0.3 (Tons, Millions)
	Commercial & Residential	57%	14%	0.6 (Tons, Millions)	0.2 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	1%	0%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	99%	100%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	67%	43%		

CALIFORNIA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	12.2	9.2	25.4	27.2
	DOT	2.7	1.8	5.6	5.5
	Other Agency	3.2	1.0	6.7	3.0
	Commercial & Residential	6.3	6.3	13.1	18.7
	No. of Companies Reporting	5	4		
RAP (Tons, Millions)	Accepted	2.3	1.5	4.8	4.4
	Used in HMA/WMA Mixtures	1.9	1.5	3.9	4.5
	Used as Aggregate	0.3	0.0	0.6	0.1
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	2.08	0.99	4.33	2.92
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	15.0%	15.0%		
	Average % for Other Agency Mixtures[1]	14.0%	12.5%		
	Average % for Commercial & Residential Mixtures[1]	18.2%	21.3%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			15.3%	16.6%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	41%	19%		
	% of RAP Mixtures Using Softer Binders	3%	0%		
	% of RAP Mixtures Using Recycling Agents	35%	32%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	3.0	0.0	6.2	0.0
	Processed Shingles Accepted	0.0	6.3	0.0	18.7
	Used in HMA/WMA Mixtures	3.0	6.7	6.2	19.8
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.08%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.04%	0.08%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.02%	0.07%
RAS (Other Reported Data)	% Companies Reporting Using RAS	20%	50%		
	% of RAS Mixtures Using Softer Binders	20%	50%		
	% of RAS Mixtures Using Recycling Agents	20%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			7.6 (Tons, Millions)	16.5 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.4 (Tons, Millions)	3.4 (Tons, Millions)
	DOT	14%	92%	0.8 (Tons, Millions)	5.0 (Tons, Millions)
	Other Agency	19%	31%	1.3 (Tons, Millions)	0.9 (Tons, Millions)
	Commercial & Residential	45%	75%	5.9 (Tons, Millions)	14.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	63%	87%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	37%	13%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	63%	100%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

COLORADO

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	4.9	3.6	9.0	9.1
	DOT	1.1	0.7	2.0	1.9
	Other Agency	1.9	1.3	3.5	3.3
	Commercial & Residential	1.9	1.5	3.5	3.9
	No. of Companies Reporting	7	6		
RAP (Tons, Millions)	Accepted	1.4	0.7	2.6	1.8
	Used in HMA/WMA Mixtures	0.9	0.8	1.7	2.0
	Used as Aggregate	0.3	0.0	0.6	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.86	0.31	1.57	0.77
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	21.1%	20.1%		
	Average % for Other Agency Mixtures[1]	16.8%	18.2%		
	Average % for Commercial & Residential Mixtures[1]	18.6%	26.2%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			19.0%	21.6%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	26%	34%		
	% of RAP Mixtures Using Softer Binders	30%	5%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.0 (Tons, Millions)	1.8 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			5.7 (Tons, Millions)	0.4 (Tons, Millions)
	DOT	71%	19%	1.4 (Tons, Millions)	0.4 (Tons, Millions)
	Other Agency	70%	36%	2.4 (Tons, Millions)	1.2 (Tons, Millions)
	Commercial & Residential	82%	15%	2.9 (Tons, Millions)	0.6 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	92%	100%		
	Additive Foaming, % of Market	1%	0%		
	Plant Foaming, % of Market	7%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	100%	83%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

CONNECTICUT

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	4.9	3.0
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

DELAWARE

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	1.3	1.6
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

DISTRICT OF COLUMBIA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	1.2	1.5
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

FLORIDA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	11.2	7.4	16.8	19.0
	DOT	4.4	2.1	6.6	5.3
	Other Agency	2.1	1.7	3.2	4.4
	Commercial & Residential	4.7	3.6	7.1	9.3
	No. of Companies Reporting	8	5		
RAP (Tons, Millions)	Accepted	3.4	2.2	5.1	5.6
	Used in HMA/WMA Mixtures	3.8	2.3	5.6	6.0
	Used as Aggregate	0.0	0.1	0.0	0.2
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.1	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	3.62	2.04	5.43	5.21
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	28.0%	29.2%		
	Average % for Other Agency Mixtures[1]	33.3%	29.4%		
	Average % for Commercial & Residential Mixtures[1]	36.3%	33.9%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			33.6%	31.5%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	14%	4%		
	% of RAP Mixtures Using Softer Binders	69%	62%		
	% of RAP Mixtures Using Recycling Agents	0%	13%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.6 (Tons, Millions)	2.1 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			4.2 (Tons, Millions)	1.8 (Tons, Millions)
	DOT	46%	40%	3.1 (Tons, Millions)	2.1 (Tons, Millions)
	Other Agency	43%	21%	1.4 (Tons, Millions)	0.9 (Tons, Millions)
	Commercial & Residential	19%	9%	1.3 (Tons, Millions)	0.9 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	100%	100%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	63%	60%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

GEORGIA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	7.4	6.5	13.6	14.5
	DOT	3.8	2.6	7.0	5.7
	Other Agency	2.0	1.9	3.7	4.1
	Commercial & Residential	1.6	2.1	2.9	4.7
	No. of Companies Reporting	6	5		
RAP (Tons, Millions)	Accepted	2.0	2.1	3.6	4.8
	Used in HMA/WMA Mixtures	2.1	2.0	3.8	4.5
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	3.31	2.25	6.07	5.03
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	25.8%	29.4%		
	Average % for Other Agency Mixtures[1]	27.8%	29.0%		
	Average % for Commercial & Residential Mixtures[1]	29.5%	32.3%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			28.2%	31.1%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	8%	33%		
	% of RAP Mixtures Using Softer Binders	18%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	14.5	0.0	32.5
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.6 (Tons, Millions)	0.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			4.1 (Tons, Millions)	0.0 (Tons, Millions)
	DOT	45%	0%	3.1 (Tons, Millions)	0.0 (Tons, Millions)
	Other Agency	32%	0%	1.2 (Tons, Millions)	0.0 (Tons, Millions)
	Commercial & Residential	12%	0%	0.4 (Tons, Millions)	0.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	8%	0%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	92%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	33%	0		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

GUAM

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	NCR	NCR	0.1	0.1
	DOT	NCR	NCR	NCR	NCR
	Other Agency	NCR	NCR	NCR	NCR
	Commercial & Residential	NCR	NCR	NCR	NCR
	No. of Companies Reporting	NCR	NCR		
RAP (Tons, Millions)	Accepted	NCR	NCR	NCR	NCR
	Used in HMA/WMA Mixtures	NCR	NCR	NCR	NCR
	Used as Aggregate	NCR	NCR	NCR	NCR
	Used in Cold-Mix Asphalt	NCR	NCR	NCR	NCR
	Used in Other	NCR	NCR	NCR	NCR
	Landfilled	NCR	NCR	NCR	NCR
	Total Tons of RAP Stockpiled at Year-End	NCR	NCR	NCR	NCR
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	NCR	NCR		
	Average % for Other Agency Mixtures[1]	NCR	NCR		
	Average % for Commercial & Residential Mixtures[1]	NCR	NCR		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			NCR	NCR
RAP (Other Reported Data)	% Companies Reporting Using RAP	NCR	NCR		
	% of RAP Fractionated	NCR	NCR		
	% of RAP Mixtures Using Softer Binders	NCR	NCR		
	% of RAP Mixtures Using Recycling Agents	NCR	NCR		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	NCR	NCR	NCR	NCR
	Processed Shingles Accepted	NCR	NCR	NCR	NCR
	Used in HMA/WMA Mixtures	NCR	NCR	NCR	NCR
	Used as Aggregate	NCR	NCR	NCR	NCR
	Used in Cold-Mix Asphalt	NCR	NCR	NCR	NCR
	Used in Other	NCR	NCR	NCR	NCR
	Landfilled	NCR	NCR	NCR	NCR
	Total Tons of RAS Stockpiled at Year-End	NCR	NCR	NCR	NCR
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	NCR	NCR		
	Average % for Other Agency Mixtures[1]	NCR	NCR		
	Average % for Commercial & Residential Mixtures[1]	NCR	NCR		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			NCR	NCR
RAS (Other Reported Data)	% Companies Reporting Using RAS	NCR	NCR		
	% of RAS Mixtures Using Softer Binders	NCR	NCR		
	% of RAS Mixtures Using Recycling Agents	NCR	NCR		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			NCR	NCR
	Total Tons Produced With WMA Technology at HMA Temperatures			NCR	NCR
	DOT	NCR	NCR	NCR	NCR
	Other Agency	NCR	NCR	NCR	NCR
	Commercial & Residential	NCR	NCR	NCR	NCR
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	NCR	NCR		
	Additive Foaming, % of Market	NCR	NCR		
	Plant Foaming, % of Market	NCR	NCR		
	Organic Additive, % of Market	NCR	NCR		
	% Companies Reporting Using WMA Technologies	NCR	NCR		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

HAWAII

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	0.6	0.8	1.0
	DOT	*	0.3	*	0.5
	Other Agency	*	0.2	*	0.3
	Commercial & Residential	*	0.1	*	0.2
	No. of Companies Reporting	*	3		
RAP (Tons, Millions)	Accepted	*	0.1	*	0.2
	Used in HMA/WMA Mixtures	*	0.1	*	0.2
	Used as Aggregate	*	0.0	*	0.1
	Used in Cold-Mix Asphalt	*	0.0	*	0.0
	Used in Other	*	0.0	*	0.0
	Landfilled	*	0.0	*	0.0
	Total Tons of RAP Stockpiled at Year-End	*	0.13	*	0.24
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	17.7%		
	Average % for Other Agency Mixtures[1]	*	14.0%		
	Average % for Commercial & Residential Mixtures[1]	*	22.4%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	18.4%
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	100%		
	% of RAP Fractionated	*	33%		
	% of RAP Mixtures Using Softer Binders	*	0%		
	% of RAP Mixtures Using Recycling Agents	*	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	0.0	*	0.0
	Processed Shingles Accepted	*	0.0	*	0.0
	Used in HMA/WMA Mixtures	*	0.0	*	0.0
	Used as Aggregate	*	0.0	*	0.0
	Used in Cold-Mix Asphalt	*	0.0	*	0.0
	Used in Other	*	0.0	*	0.0
	Landfilled	*	0.0	*	0.0
	Total Tons of RAS Stockpiled at Year-End	*	0.0	*	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	0.00%		
	Average % for Other Agency Mixtures[1]	*	0.00%		
	Average % for Commercial & Residential Mixtures[1]	*	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	0%		
	% of RAS Mixtures Using Softer Binders	*	0%		
	% of RAS Mixtures Using Recycling Agents	*	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	0.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			*	0.0 (Tons, Millions)
	DOT	*	0%	*	0.0 (Tons, Millions)
	Other Agency	*	0%	*	0.0 (Tons, Millions)
	Commercial & Residential	*	0%	*	0.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	0%		
	Additive Foaming, % of Market	*	0%		
	Plant Foaming, % of Market	*	0%		
	Organic Additive, % of Market	*	0%		
	% Companies Reporting Using WMA Technologies	*	0%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

IDAHO

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	1.2	1.3	2.9	3.0
	DOT	0.6	0.5	1.5	1.2
	Other Agency	0.3	0.4	0.7	0.9
	Commercial & Residential	0.3	0.4	0.7	0.9
	No. of Companies Reporting	5	5		
RAP (Tons, Millions)	Accepted	0.3	0.3	0.7	0.8
	Used in HMA/WMA Mixtures	0.3	0.3	0.8	0.8
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.65	0.59	1.56	1.39
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	25.0%	28.2%		
	Average % for Other Agency Mixtures[1]	24.6%	25.0%		
	Average % for Commercial & Residential Mixtures[1]	30.0%	26.6%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			26.1%	26.1%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	1%	20%		
	% of RAP Mixtures Using Softer Binders	86%	87%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.5 (Tons, Millions)	0.6 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.2 (Tons, Millions)	0.6 (Tons, Millions)
	DOT	51%	51%	0.8 (Tons, Millions)	0.6 (Tons, Millions)
	Other Agency	72%	12%	0.5 (Tons, Millions)	0.1 (Tons, Millions)
	Commercial & Residential	52%	53%	0.4 (Tons, Millions)	0.5 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	77%	49%		
	Additive Foaming, % of Market	8%	17%		
	Plant Foaming, % of Market	15%	34%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	80%	60%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

ILLINOIS

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	8.4	7.2	14.4	14.9
	DOT	4.0	2.3	6.9	4.8
	Other Agency	1.8	2.4	3.1	5.0
	Commercial & Residential	2.6	2.5	4.5	5.1
	No. of Companies Reporting	21	18		
RAP (Tons, Millions)	Accepted	2.8	2.5	4.8	5.2
	Used in HMA/WMA Mixtures	2.2	2.0	3.7	4.1
	Used as Aggregate	0.2	0.4	0.4	0.8
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.1	0.0	0.1
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	2.00	1.16	3.43	2.39
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	22.3%	24.5%		
	Average % for Other Agency Mixtures[1]	22.9%	27.4%		
	Average % for Commercial & Residential Mixtures[1]	27.3%	28.9%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			25.7%	27.8%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	58%	61%		
	% of RAP Mixtures Using Softer Binders	45%	63%		
	% of RAP Mixtures Using Recycling Agents	1%	9%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	18.8	3.1	32.2	6.4
	Processed Shingles Accepted	27.8	72.3	47.7	149.2
	Used in HMA/WMA Mixtures	34.1	84.1	58.5	173.5
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	14.1	3.5	24.2	7.2
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.65%	1.03%		
	Average % for Other Agency Mixtures[1]	0.32%	1.52%		
	Average % for Commercial & Residential Mixtures[1]	0.47%	1.14%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.41%	1.16%
RAS (Other Reported Data)	% Companies Reporting Using RAS	48%	61%		
	% of RAS Mixtures Using Softer Binders	35%	54%		
	% of RAS Mixtures Using Recycling Agents	0%	4%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.8 (Tons, Millions)	2.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.3 (Tons, Millions)	2.8 (Tons, Millions)
	DOT	8%	27%	0.5 (Tons, Millions)	1.3 (Tons, Millions)
	Other Agency	16%	43%	0.5 (Tons, Millions)	2.2 (Tons, Millions)
	Commercial & Residential	2%	26%	0.1 (Tons, Millions)	1.3 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	62%	64%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	38%	36%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	43%	50%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

INDIANA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	7.5	10.3	13.0	14.0
	DOT	2.9	4.2	5.0	5.7
	Other Agency	2.6	3.0	4.5	4.1
	Commercial & Residential	2.0	3.1	3.5	4.2
	No. of Companies Reporting	7	6		
RAP (Tons, Millions)	Accepted	1.4	2.7	2.4	3.6
	Used in HMA/WMA Mixtures	1.8	2.4	3.1	3.3
	Used as Aggregate	0.0	0.2	0.0	0.2
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	2.35	3.71	4.07	5.05
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	23.5%	23.0%		
	Average % for Other Agency Mixtures[1]	23.3%	23.5%		
	Average % for Commercial & Residential Mixtures[1]	25.2%	24.8%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			23.9%	23.4%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	61%	51%		
	% of RAP Mixtures Using Softer Binders	4%	1%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.4	6.0	0.7	8.2
	Processed Shingles Accepted	3.6	0.4	6.2	0.5
	Used in HMA/WMA Mixtures	4.1	6.2	7.1	8.4
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	15.9	2.3	27.6	3.1
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.04%	0.06%		
	Average % for Other Agency Mixtures[1]	0.04%	0.06%		
	Average % for Commercial & Residential Mixtures[1]	0.06%	0.06%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.05%	0.06%
RAS (Other Reported Data)	% Companies Reporting Using RAS	43%	50%		
	% of RAS Mixtures Using Softer Binders	25%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			3.5 (Tons, Millions)	1.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			4.5 (Tons, Millions)	3.9 (Tons, Millions)
	DOT	71%	44%	3.6 (Tons, Millions)	2.5 (Tons, Millions)
	Other Agency	50%	37%	2.3 (Tons, Millions)	1.5 (Tons, Millions)
	Commercial & Residential	62%	20%	2.1 (Tons, Millions)	0.9 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	44%	16%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	56%	84%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	43%	33%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

IOWA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	1.9	1.7	5.2	4.9
	DOT	0.8	1.0	2.2	2.8
	Other Agency	0.8	0.5	2.2	1.4
	Commercial & Residential	0.3	0.2	0.8	0.7
	No. of Companies Reporting	4	5		
RAP (Tons, Millions)	Accepted	0.3	0.3	0.7	0.9
	Used in HMA/WMA Mixtures	0.3	0.3	0.9	0.9
	Used as Aggregate	0.0	0.0	0.1	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.53	0.65	1.45	1.83
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	15.5%	16.9%		
	Average % for Other Agency Mixtures[1]	16.3%	16.9%		
	Average % for Commercial & Residential Mixtures[1]	18.5%	18.8%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			16.5%	17.4%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	5%	0%		
	% of RAP Mixtures Using Softer Binders	25%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	5.0	0.0	14.1
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.0 (Tons, Millions)	0.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.0 (Tons, Millions)	0.1 (Tons, Millions)
	DOT	18%	2%	0.4 (Tons, Millions)	0.1 (Tons, Millions)
	Other Agency	20%	0%	0.4 (Tons, Millions)	0.0 (Tons, Millions)
	Commercial & Residential	21%	4%	0.2 (Tons, Millions)	0.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	0%	0%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	100%	100%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	25%	20%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

KANSAS

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	2.4	2.4	3.5	4.0
	DOT	1.4	1.4	2.0	2.4
	Other Agency	0.4	0.5	0.6	0.8
	Commercial & Residential	0.6	0.5	0.9	0.8
	No. of Companies Reporting	3	3		
RAP (Tons, Millions)	Accepted	0.7	1.0	1.0	1.7
	Used in HMA/WMA Mixtures	0.6	0.6	0.9	1.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.79	0.80	1.15	1.31
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	22.7%	22.3%		
	Average % for Other Agency Mixtures[1]	25.0%	25.6%		
	Average % for Commercial & Residential Mixtures[1]	27.2%	25.0%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			25.8%	24.7%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	35%	32%		
	% of RAP Mixtures Using Softer Binders	75%	88%		
	% of RAP Mixtures Using Recycling Agents	0%	4%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	3.0	6.0	4.4	9.9
	Processed Shingles Accepted	4.0	1.5	5.8	2.5
	Used in HMA/WMA Mixtures	4.5	2.0	6.6	3.3
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	5.5	7.4	8.0	12.2
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.33%	0.12%		
	Average % for Other Agency Mixtures[1]	0.17%	0.06%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.19%	0.08%
RAS (Other Reported Data)	% Companies Reporting Using RAS	67%	67%		
	% of RAS Mixtures Using Softer Binders	68%	100%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.8 (Tons, Millions)	1.3 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.7 (Tons, Millions)	0.9 (Tons, Millions)
	DOT	47%	67%	1.0 (Tons, Millions)	1.6 (Tons, Millions)
	Other Agency	51%	56%	0.3 (Tons, Millions)	0.5 (Tons, Millions)
	Commercial & Residential	28%	13%	0.2 (Tons, Millions)	0.1 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	54%	89%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	46%	11%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	67%	67%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

KENTUCKY

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	1.7	3.6	4.0	7.5
	DOT	0.7	2.0	1.6	4.2
	Other Agency	0.5	0.9	1.2	1.9
	Commercial & Residential	0.5	0.7	1.2	1.4
	No. of Companies Reporting	5	7		
RAP (Tons, Millions)	Accepted	0.4	0.5	0.8	1.1
	Used in HMA/WMA Mixtures	0.3	0.6	0.7	1.3
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.58	0.96	1.36	1.98
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	16.5%	15.5%		
	Average % for Other Agency Mixtures[1]	16.0%	17.4%		
	Average % for Commercial & Residential Mixtures[1]	20.6%	18.9%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			17.6%	16.7%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	50%	34%		
	% of RAP Mixtures Using Softer Binders	5%	3%		
	% of RAP Mixtures Using Recycling Agents	4%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	3.0	3.5	7.1	7.2
	Processed Shingles Accepted	6.0	0.0	14.1	0.0
	Used in HMA/WMA Mixtures	6.0	7.7	14.1	15.9
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	10.5	50.4	24.7	104.3
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.35%	0.21%		
	Average % for Other Agency Mixtures[1]	0.35%	0.21%		
	Average % for Commercial & Residential Mixtures[1]	0.35%	0.21%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.35%	0.21%
RAS (Other Reported Data)	% Companies Reporting Using RAS	20%	14%		
	% of RAS Mixtures Using Softer Binders	50%	50%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			2.3 (Tons, Millions)	2.5 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.2 (Tons, Millions)	1.3 (Tons, Millions)
	DOT	100%	39%	1.6 (Tons, Millions)	1.6 (Tons, Millions)
	Other Agency	98%	35%	1.2 (Tons, Millions)	0.6 (Tons, Millions)
	Commercial & Residential	63%	43%	0.7 (Tons, Millions)	0.6 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	58%	75%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	42%	25%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	80%	57%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

LOUISIANA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	1.1	1.6	7.5	8.1
	DOT	0.7	0.2	5.0	0.9
	Other Agency	0.1	0.8	0.5	4.0
	Commercial & Residential	0.3	0.6	2.0	3.2
	No. of Companies Reporting	3	3		
RAP (Tons, Millions)	Accepted	0.2	0.4	1.4	2.0
	Used in HMA/WMA Mixtures	0.2	0.3	1.3	1.7
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.05	0.21	0.35	1.02
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	18.2%	20.0%		
	Average % for Other Agency Mixtures[1]	12.3%	21.3%		
	Average % for Commercial & Residential Mixtures[1]	21.0%	23.3%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			17.3%	20.7%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	25%	50%		
	% of RAP Mixtures Using Softer Binders	8%	8%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			5.7 (Tons, Millions)	6.9 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.4 (Tons, Millions)	0.6 (Tons, Millions)
	DOT	79%	94%	4.0 (Tons, Millions)	0.9 (Tons, Millions)
	Other Agency	100%	86%	0.5 (Tons, Millions)	3.4 (Tons, Millions)
	Commercial & Residential	82%	100%	1.6 (Tons, Millions)	3.2 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	0%	0%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	100%	100%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	100%	100%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

MAINE

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	2.7	2.9	2.7	2.9
	DOT	0.7	0.8	0.7	0.8
	Other Agency	0.1	0.7	0.1	0.7
	Commercial & Residential	0.2	1.4	0.2	1.4
	No. of Companies Reporting	3	6		
RAP (Tons, Millions)	Accepted	0.4	0.3	0.4	0.3
	Used in HMA/WMA Mixtures	0.5	0.5	0.5	0.5
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.37	0.29	0.37	0.29
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	17.0%	16.5%		
	Average % for Other Agency Mixtures[1]	17.0%	18.9%		
	Average % for Commercial & Residential Mixtures[1]	17.6%	19.3%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			17.2%	18.2%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	17%	0%		
	% of RAP Mixtures Using Softer Binders	0%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	5%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	4.2	8.2	4.2	8.2
	Used in HMA/WMA Mixtures	4.2	7.9	4.2	7.9
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.1	0.3	0.1	0.3
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.22%	0.56%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.16%	0.27%
RAS (Other Reported Data)	% Companies Reporting Using RAS	67%	67%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.3 (Tons, Millions)	0.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.4 (Tons, Millions)	1.5 (Tons, Millions)
	DOT	86%	56%	0.6 (Tons, Millions)	0.5 (Tons, Millions)
	Other Agency	56%	58%	0.1 (Tons, Millions)	0.4 (Tons, Millions)
	Commercial & Residential	0%	44%	0.0 (Tons, Millions)	0.6 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	100%	100%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	100%	100%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

MARYLAND

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	4.6	3.3	6.3	6.6
	DOT	1.2	1.0	1.6	2.1
	Other Agency	1.6	1.1	2.2	2.1
	Commercial & Residential	1.8	1.2	2.5	2.4
	No. of Companies Reporting	8	9		
RAP (Tons, Millions)	Accepted	1.7	1.4	2.3	2.7
	Used in HMA/WMA Mixtures	1.3	0.9	1.8	1.9
	Used as Aggregate	0.3	0.2	0.5	0.3
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	2.65	2.27	3.63	4.49
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	25.6%	25.9%		
	Average % for Other Agency Mixtures[1]	25.3%	26.5%		
	Average % for Commercial & Residential Mixtures[1]	31.6%	32.5%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			28.3%	28.3%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	5%	7%		
	% of RAP Mixtures Using Softer Binders	20%	33%		
	% of RAP Mixtures Using Recycling Agents	6%	8%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	10.0	0.0	19.8
	Processed Shingles Accepted	10.0	0.0	13.7	0.0
	Used in HMA/WMA Mixtures	3.1	10.4	4.2	20.6
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	13.0	5.6	17.8	11.1
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.15%	0.35%		
	Average % for Other Agency Mixtures[1]	0.00%	0.25%		
	Average % for Commercial & Residential Mixtures[1]	0.08%	0.35%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.07%	0.31%
RAS (Other Reported Data)	% Companies Reporting Using RAS	25%	22%		
	% of RAS Mixtures Using Softer Binders	100%	80%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.6 (Tons, Millions)	1.4 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			2.3 (Tons, Millions)	2.2 (Tons, Millions)
	DOT	36%	84%	0.6 (Tons, Millions)	1.7 (Tons, Millions)
	Other Agency	69%	53%	1.5 (Tons, Millions)	1.1 (Tons, Millions)
	Commercial & Residential	73%	32%	1.8 (Tons, Millions)	0.8 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	31%	15%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	69%	85%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	75%	56%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

MASSACHUSETTS

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	2.9	1.8	6.5	7.0
	DOT	0.9	0.6	2.0	2.3
	Other Agency	1.1	0.4	2.5	1.7
	Commercial & Residential	0.9	0.8	2.0	3.0
	No. of Companies Reporting	4	6		
RAP (Tons, Millions)	Accepted	0.5	0.4	1.1	1.7
	Used in HMA/WMA Mixtures	0.4	0.3	1.0	1.3
	Used as Aggregate	0.0	0.0	0.1	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.69	0.92	1.56	3.67
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	14.8%	16.3%		
	Average % for Other Agency Mixtures[1]	14.3%	16.0%		
	Average % for Commercial & Residential Mixtures[1]	18.5%	20.2%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			15.1%	18.0%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	7%	0%		
	% of RAP Mixtures Using Softer Binders	4%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	10.3	0.0	41.0
	Processed Shingles Accepted	11.2	0.0	25.1	0.0
	Used in HMA/WMA Mixtures	1.1	1.5	2.5	6.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	26.3	0.0	58.9	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	60.9	12.5	136.5	49.7
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.06%	0.14%		
	Average % for Commercial & Residential Mixtures[1]	0.06%	0.14%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.04%	0.09%
RAS (Other Reported Data)	% Companies Reporting Using RAS	50%	17%		
	% of RAS Mixtures Using Softer Binders	25%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			3.3 (Tons, Millions)	2.6 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.5 (Tons, Millions)	2.4 (Tons, Millions)
	DOT	97%	95%	2.0 (Tons, Millions)	2.2 (Tons, Millions)
	Other Agency	62%	41%	1.5 (Tons, Millions)	0.7 (Tons, Millions)
	Commercial & Residential	15%	70%	0.3 (Tons, Millions)	2.1 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	86%	42%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	0%		
	Organic Additive, % of Market	23%	58%		
	% Companies Reporting Using WMA Technologies	100%	100%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

MICHIGAN

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	10.0	8.9	14.8	14.7
	DOT	4.1	3.1	6.1	5.1
	Other Agency	2.3	2.4	3.4	3.9
	Commercial & Residential	3.6	3.4	5.3	5.7
	No. of Companies Reporting	9	7		
RAP (Tons, Millions)	Accepted	2.4	2.5	3.5	4.2
	Used in HMA/WMA Mixtures	2.6	2.4	3.9	3.9
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	14.98	2.28	22.17	3.77
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	20.6%	22.5%		
	Average % for Other Agency Mixtures[1]	23.3%	23.7%		
	Average % for Commercial & Residential Mixtures[1]	28.7%	29.2%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			26.4%	26.8%
RAP (Other Reported Data)	% Companies Reporting Using RAP	89%	100%		
	% of RAP Fractionated	22%	28%		
	% of RAP Mixtures Using Softer Binders	35%	22%		
	% of RAP Mixtures Using Recycling Agents	0%	1%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	1.0	1.5	1.5	2.5
	Processed Shingles Accepted	5.0	1.0	7.4	1.7
	Used in HMA/WMA Mixtures	5.0	0.5	7.4	0.8
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	1.0	2.0	1.5	3.3
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.13%	0.05%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.05%	0.01%
RAS (Other Reported Data)	% Companies Reporting Using RAS	11%	14%		
	% of RAS Mixtures Using Softer Binders	50%	100%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.4 (Tons, Millions)	0.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			2.6 (Tons, Millions)	2.6 (Tons, Millions)
	DOT	25%	25%	1.5 (Tons, Millions)	1.3 (Tons, Millions)
	Other Agency	19%	17%	0.6 (Tons, Millions)	0.7 (Tons, Millions)
	Commercial & Residential	15%	11%	0.9 (Tons, Millions)	0.6 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	100%	2%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	98%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	33%	29%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

MINNESOTA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2020
HMA/WMA (Tons, Millions)	Total	7.3	8.6	12.2	9.2
	DOT	2.4	2.0	4.0	2.2
	Other Agency	2.1	4.2	3.5	4.5
	Commercial & Residential	2.8	2.4	4.7	2.5
	No. of Companies Reporting	5	6		
RAP (Tons, Millions)	Accepted	2.3	2.6	3.9	2.8
	Used in HMA/WMA Mixtures	1.8	1.9	3.0	2.0
	Used as Aggregate	0.7	0.6	1.2	0.7
	Used in Cold-Mix Asphalt	0.1	0.1	0.2	0.1
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	3.96	1.88	6.62	2.00
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	18.8%	20.5%		
	Average % for Other Agency Mixtures[1]	24.8%	21.8%		
	Average % for Commercial & Residential Mixtures[1]	27.6%	23.5%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			24.4%	22.0%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	12%	11%		
	% of RAP Mixtures Using Softer Binders	19%	20%		
	% of RAP Mixtures Using Recycling Agents	11%	2%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	7.0	0.0	7.5
	Processed Shingles Accepted	10.0	0.0	16.7	0.0
	Used in HMA/WMA Mixtures	10.0	18.7	16.7	19.9
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	1.0	18.5	1.7	19.7
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.14%	0.05%		
	Average % for Other Agency Mixtures[1]	0.14%	0.05%		
	Average % for Commercial & Residential Mixtures[1]	0.14%	0.32%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.14%	0.22%
RAS (Other Reported Data)	% Companies Reporting Using RAS	20%	50%		
	% of RAS Mixtures Using Softer Binders	10%	33%		
	% of RAS Mixtures Using Recycling Agents	2%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			6.6 (Tons, Millions)	2.7 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.3 (Tons, Millions)	3.1 (Tons, Millions)
	DOT	44%	42%	1.9 (Tons, Millions)	0.9 (Tons, Millions)
	Other Agency	69%	74%	2.4 (Tons, Millions)	3.3 (Tons, Millions)
	Commercial & Residential	78%	63%	3.5 (Tons, Millions)	1.6 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	3%	8%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	94%	92%		
	Organic Additive, % of Market	3%	0%		
	% Companies Reporting Using WMA Technologies	60%	67%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

MISSISSIPPI

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	4.2	3.4	4.3	5.4
	DOT	2.4	2.0	2.5	3.2
	Other Agency	1.0	0.8	1.0	1.2
	Commercial & Residential	0.8	0.6	0.8	1.0
	No. of Companies Reporting	7	5		
RAP (Tons, Millions)	Accepted	0.7	0.5	0.7	0.8
	Used in HMA/WMA Mixtures	0.9	0.7	0.9	1.1
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.61	0.46	0.63	0.74
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	19.4%	21.0%		
	Average % for Other Agency Mixtures[1]	19.4%	20.8%		
	Average % for Commercial & Residential Mixtures[1]	22.2%	18.0%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			20.2%	20.0%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	17%	5%		
	% of RAP Mixtures Using Softer Binders	2%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			2.5 (Tons, Millions)	3.4 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.2 (Tons, Millions)	0.8 (Tons, Millions)
	DOT	87%	78%	2.2 (Tons, Millions)	2.5 (Tons, Millions)
	Other Agency	81%	93%	0.8 (Tons, Millions)	1.1 (Tons, Millions)
	Commercial & Residential	88%	59%	0.7 (Tons, Millions)	0.6 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	7%	0%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	93%	100%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	86%	80%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

MISSOURI

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	2.4	2.5	10.2	8.0
	DOT	1.0	0.7	4.3	2.4
	Other Agency	0.5	0.4	2.1	1.2
	Commercial & Residential	0.9	1.4	3.8	4.4
	No. of Companies Reporting	5	4		
RAP (Tons, Millions)	Accepted	0.5	0.6	2.3	1.8
	Used in HMA/WMA Mixtures	0.5	0.7	2.3	2.2
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.42	0.46	1.76	1.47
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	20.0%	25.6%		
	Average % for Other Agency Mixtures[1]	24.6%	25.6%		
	Average % for Commercial & Residential Mixtures[1]	25.6%	29.8%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			22.8%	27.0%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	16%	24%		
	% of RAP Mixtures Using Softer Binders	56%	60%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.5	0.6	2.1	2.0
	Used in HMA/WMA Mixtures	1.7	1.1	7.2	3.5
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	4.0	7.5	17.0	24.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.05%	0.07%		
	Average % for Other Agency Mixtures[1]	0.05%	0.07%		
	Average % for Commercial & Residential Mixtures[1]	0.10%	0.02%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.07%	0.04%
RAS (Other Reported Data)	% Companies Reporting Using RAS	40%	50%		
	% of RAS Mixtures Using Softer Binders	100%	100%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.9 (Tons, Millions)	1.5 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			2.1 (Tons, Millions)	1.2 (Tons, Millions)
	DOT	52%	72%	2.3 (Tons, Millions)	1.7 (Tons, Millions)
	Other Agency	30%	20%	0.6 (Tons, Millions)	0.2 (Tons, Millions)
	Commercial & Residential	30%	17%	1.1 (Tons, Millions)	0.8 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	67%	80%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	33%	20%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	40%	75%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

MONTANA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	4.1	4.5
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

NEBRASKA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	0.4	*	3.0	3.1
	DOT	0.1	*	0.4	*
	Other Agency	0.2	*	1.1	*
	Commercial & Residential	0.2	*	1.5	*
	No. of Companies Reporting	3	*		
RAP (Tons, Millions)	Accepted	0.1	*	0.8	*
	Used in HMA/WMA Mixtures	0.1	*	0.6	*
	Used as Aggregate	0.0	*	0.2	*
	Used in Cold-Mix Asphalt	0.0	*	0.0	*
	Used in Other	0.0	*	0.0	*
	Landfilled	0.0	*	0.0	*
	Total Tons of RAP Stockpiled at Year-End	0.12	*	0.90	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	22.0%	*		
	Average % for Other Agency Mixtures[1]	20.0%	*		
	Average % for Commercial & Residential Mixtures[1]	20.0%	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			20.3%	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	*		
	% of RAP Fractionated	0%	*		
	% of RAP Mixtures Using Softer Binders	0%	*		
	% of RAP Mixtures Using Recycling Agents	0%	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	*	0.0	*
	Processed Shingles Accepted	0.0	*	0.0	*
	Used in HMA/WMA Mixtures	0.0	*	0.0	*
	Used as Aggregate	0.0	*	0.0	*
	Used in Cold-Mix Asphalt	0.0	*	0.0	*
	Used in Other	0.0	*	0.0	*
	Landfilled	0.0	*	0.0	*
	Total Tons of RAS Stockpiled at Year-End	0.0	*	0.0	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	*		
	Average % for Other Agency Mixtures[1]	0.00%	*		
	Average % for Commercial & Residential Mixtures[1]	0.00%	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	*		
	% of RAS Mixtures Using Softer Binders	0%	*		
	% of RAS Mixtures Using Recycling Agents	0%	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.2 (Tons, Millions)	*
	Total Tons Produced With WMA Technology at HMA Temperatures			1.3 (Tons, Millions)	*
	DOT	87%	*	0.3 (Tons, Millions)	*
	Other Agency	99%	*	1.2 (Tons, Millions)	*
	Commercial & Residential	0%	*	0.0 (Tons, Millions)	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	0%	*		
	Additive Foaming, % of Market	0%	*		
	Plant Foaming, % of Market	100%	*		
	Organic Additive, % of Market	0%	*		
	% Companies Reporting Using WMA Technologies	67%	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

NEVADA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	1.2	1.6	3.5	3.7
	DOT	0.2	0.5	0.6	1.1
	Other Agency	0.7	0.6	2.0	1.4
	Commercial & Residential	0.3	0.5	0.9	1.2
	No. of Companies Reporting	4	4		
RAP (Tons, Millions)	Accepted	0.2	0.2	0.6	0.5
	Used in HMA/WMA Mixtures	0.2	0.3	0.6	0.7
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.12	0.29	0.34	0.65
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	13.5%	16.5%		
	Average % for Other Agency Mixtures[1]	16.3%	15.0%		
	Average % for Commercial & Residential Mixtures[1]	25.0%	24.5%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			17.2%	18.8%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	0%	0%		
	% of RAP Mixtures Using Softer Binders	13%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	1%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.0 (Tons, Millions)	0.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.1 (Tons, Millions)	0.0 (Tons, Millions)
	DOT	0%	0%	0.0 (Tons, Millions)	0.0 (Tons, Millions)
	Other Agency	1%	3%	0.0 (Tons, Millions)	0.0 (Tons, Millions)
	Commercial & Residential	10%	2%	0.1 (Tons, Millions)	0.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	100%	0%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	100%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	25%	25%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

NEW HAMPSHIRE

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	1.1	1.6	1.6	1.6
	DOT	0.4	0.7	0.6	0.7
	Other Agency	0.3	0.3	0.4	0.3
	Commercial & Residential	0.4	0.6	0.6	0.6
	No. of Companies Reporting	3	3		
RAP (Tons, Millions)	Accepted	0.3	0.2	0.4	0.3
	Used in HMA/WMA Mixtures	0.2	0.3	0.3	0.4
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.32	0.29	0.46	0.30
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	15.0%	22.0%		
	Average % for Other Agency Mixtures[1]	18.3%	22.0%		
	Average % for Commercial & Residential Mixtures[1]	19.3%	22.7%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			16.9%	22.3%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	0%	0%		
	% of RAP Mixtures Using Softer Binders	0%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	2.7	2.1	3.9	2.2
	Used in HMA/WMA Mixtures	2.7	2.1	3.9	2.2
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.33%	0.08%		
	Average % for Commercial & Residential Mixtures[1]	0.33%	0.21%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.25%	0.014%
RAS (Other Reported Data)	% Companies Reporting Using RAS	33%	33%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.1 (Tons, Millions)	0.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.4 (Tons, Millions)	0.3 (Tons, Millions)
	DOT	100%	33%	0.6 (Tons, Millions)	0.2 (Tons, Millions)
	Other Agency	100%	37%	0.4 (Tons, Millions)	0.1 (Tons, Millions)
	Commercial & Residential	85%	8%	0.5 (Tons, Millions)	0.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	0%	50%		
	Additive Foaming, % of Market	17%	0%		
	Plant Foaming, % of Market	72%	17%		
	Organic Additive, % of Market	11%	33%		
	% Companies Reporting Using WMA Technologies	100%	100%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

NEW JERSEY

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	4.8	3.7	9.8	10.5
	DOT	0.7	0.4	1.4	1.2
	Other Agency	2.3	1.9	4.7	5.4
	Commercial & Residential	1.8	1.4	3.7	3.9
	No. of Companies Reporting	4	3		
RAP (Tons, Millions)	Accepted	1.1	1.5	2.3	4.1
	Used in HMA/WMA Mixtures	0.8	0.8	1.6	2.1
	Used as Aggregate	0.0	0.0	0.1	0.1
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.1	0.0	0.1	0.0
	Total Tons of RAP Stockpiled at Year-End	2.30	9.59	4.69	26.89
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	14.0%	15.0%		
	Average % for Other Agency Mixtures[1]	16.0%	16.7%		
	Average % for Commercial & Residential Mixtures[1]	22.3%	28.3%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			16.8%	20.1%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	25%	33%		
	% of RAP Mixtures Using Softer Binders	3%	4%		
	% of RAP Mixtures Using Recycling Agents	24%	30%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.0 (Tons, Millions)	0.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.4 (Tons, Millions)	3.7 (Tons, Millions)
	DOT	31%	23%	0.4 (Tons, Millions)	0.3 (Tons, Millions)
	Other Agency	5%	64%	0.3 (Tons, Millions)	3.4 (Tons, Millions)
	Commercial & Residential	20%	0%	0.7 (Tons, Millions)	0.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	0%	100%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	100%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	25%	33%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

NEW MEXICO

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	3.8	4.0
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

NEW YORK

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	5.6	4.5	17.5	18.5
	DOT	1.5	1.4	4.7	5.9
	Other Agency	2.4	1.9	7.5	7.8
	Commercial & Residential	1.7	1.2	5.3	4.8
	No. of Companies Reporting	13	9		
RAP (Tons, Millions)	Accepted	0.9	0.6	2.8	2.4
	Used in HMA/WMA Mixtures	1.0	0.6	3.1	2.6
	Used as Aggregate	0.0	0.0	0.1	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.89	0.65	2.79	2.65
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	17.6%	15.2%		
	Average % for Other Agency Mixtures[1]	16.9%	13.8%		
	Average % for Commercial & Residential Mixtures[1]	18.3%	14.4%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			17.6%	14.1%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	17%	0%		
	% of RAP Mixtures Using Softer Binders	2%	0%		
	% of RAP Mixtures Using Recycling Agents	8%	2%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			4.0 (Tons, Millions)	1.7 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			5.0 (Tons, Millions)	2.1 (Tons, Millions)
	DOT	67%	37%	3.1 (Tons, Millions)	2.2 (Tons, Millions)
	Other Agency	60%	10%	4.5 (Tons, Millions)	0.8 (Tons, Millions)
	Commercial & Residential	26%	17%	1.4 (Tons, Millions)	0.8 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	41%	74%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	59%	26%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	85%	78%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

NORTH CAROLINA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	9.9	9.7	12.0	14.0
	DOT	6.2	6.7	7.5	9.7
	Other Agency	1.0	0.7	1.2	1.0
	Commercial & Residential	2.7	2.3	3.3	3.3
	No. of Companies Reporting	9	9		
RAP (Tons, Millions)	Accepted	3.7	2.6	4.4	3.8
	Used in HMA/WMA Mixtures	3.0	3.0	3.7	4.4
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	5.60	4.39	6.78	6.35
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	30.0%	31.8%		
	Average % for Other Agency Mixtures[1]	25.2%	28.3%		
	Average % for Commercial & Residential Mixtures[1]	32.7%	31.8%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			30.6%	31.3%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	42%	27%		
	% of RAP Mixtures Using Softer Binders	36%	32%		
	% of RAP Mixtures Using Recycling Agents	10%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	35.0	60.0	42.4	86.8
	Processed Shingles Accepted	27.0	21.5	32.7	31.1
	Used in HMA/WMA Mixtures	74.3	10.1	90.1	14.6
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	179.0	173.5	217.0	251.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	1.10%	0.16%		
	Average % for Other Agency Mixtures[1]	0.60%	0.07%		
	Average % for Commercial & Residential Mixtures[1]	0.90%	0.12%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.75%	0.10%
RAS (Other Reported Data)	% Companies Reporting Using RAS	44%	44%		
	% of RAS Mixtures Using Softer Binders	100%	88%		
	% of RAS Mixtures Using Recycling Agents	25%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			2.3 (Tons, Millions)	1.2 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			2.4 (Tons, Millions)	1.6 (Tons, Millions)
	DOT	51%	28%	3.8 (Tons, Millions)	2.8 (Tons, Millions)
	Other Agency	22%	0%	0.3 (Tons, Millions)	0.0 (Tons, Millions)
	Commercial & Residential	19%	1%	0.6 (Tons, Millions)	0.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	100%	100%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	56%	44%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

NORTH DAKOTA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	2.5	2.6
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

NORTHERN MARIANA ISLANDS

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	NCR	NCR	0.02	0.02
	DOT	NCR	NCR	NCR	NCR
	Other Agency	NCR	NCR	NCR	NCR
	Commercial & Residential	NCR	NCR	NCR	NCR
	No. of Companies Reporting	NCR	NCR		
RAP (Tons, Millions)	Accepted	NCR	NCR	NCR	NCR
	Used in HMA/WMA Mixtures	NCR	NCR	NCR	NCR
	Used as Aggregate	NCR	NCR	NCR	NCR
	Used in Cold-Mix Asphalt	NCR	NCR	NCR	NCR
	Used in Other	NCR	NCR	NCR	NCR
	Landfilled	NCR	NCR	NCR	NCR
	Total Tons of RAP Stockpiled at Year-End	NCR	NCR	NCR	NCR
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	NCR	NCR		
	Average % for Other Agency Mixtures[1]	NCR	NCR		
	Average % for Commercial & Residential Mixtures[1]	NCR	NCR		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			NCR	NCR
RAP (Other Reported Data)	% Companies Reporting Using RAP	NCR	NCR		
	% of RAP Fractionated	NCR	NCR		
	% of RAP Mixtures Using Softer Binders	NCR	NCR		
	% of RAP Mixtures Using Recycling Agents	NCR	NCR		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	NCR	NCR	NCR	NCR
	Processed Shingles Accepted	NCR	NCR	NCR	NCR
	Used in HMA/WMA Mixtures	NCR	NCR	NCR	NCR
	Used as Aggregate	NCR	NCR	NCR	NCR
	Used in Cold-Mix Asphalt	NCR	NCR	NCR	NCR
	Used in Other	NCR	NCR	NCR	NCR
	Landfilled	NCR	NCR	NCR	NCR
	Total Tons of RAS Stockpiled at Year-End	NCR	NCR	NCR	NCR
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	NCR	NCR		
	Average % for Other Agency Mixtures[1]	NCR	NCR		
	Average % for Commercial & Residential Mixtures[1]	NCR	NCR		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			NCR	NCR
RAS (Other Reported Data)	% Companies Reporting Using RAS	NCR	NCR		
	% of RAS Mixtures Using Softer Binders	NCR	NCR		
	% of RAS Mixtures Using Recycling Agents	NCR	NCR		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			NCR	NCR
	Total Tons Produced With WMA Technology at HMA Temperatures			NCR	NCR
	DOT	NCR	NCR	NCR	NCR
	Other Agency	NCR	NCR	NCR	NCR
	Commercial & Residential	NCR	NCR	NCR	NCR
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	NCR	NCR		
	Additive Foaming, % of Market	NCR	NCR		
	Plant Foaming, % of Market	NCR	NCR		
	Organic Additive, % of Market	NCR	NCR		
	% Companies Reporting Using WMA Technologies	NCR	NCR		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

OHIO

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	11.8	13.2	18.0	14.8
	DOT	4.3	4.3	6.6	4.8
	Other Agency	3.9	4.5	5.9	5.0
	Commercial & Residential	3.6	4.4	5.5	5.0
	No. of Companies Reporting	12	9		
RAP (Tons, Millions)	Accepted	3.3	4.1	5.0	4.6
	Used in HMA/WMA Mixtures	3.4	3.6	5.1	4.0
	Used as Aggregate	0.1	0.0	0.1	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	3.81	3.09	5.81	3.46
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	25.0%	27.2%		
	Average % for Other Agency Mixtures[1]	29.9%	25.3%		
	Average % for Commercial & Residential Mixtures[1]	32.6%	28.1%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			28.4%	27.1%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	19%	20%		
	% of RAP Mixtures Using Softer Binders	46%	30%		
	% of RAP Mixtures Using Recycling Agents	9%	3%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	6.1	0.0	9.3	0.0
	Processed Shingles Accepted	0.1	0.0	0.2	0.0
	Used in HMA/WMA Mixtures	3.7	2.8	5.6	3.1
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	29.0	24.0	44.2	26.9
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.02%	0.00%		
	Average % for Other Agency Mixtures[1]	0.05%	0.01%		
	Average % for Commercial & Residential Mixtures[1]	0.06%	0.03%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.03%	0.02%
RAS (Other Reported Data)	% Companies Reporting Using RAS	25%	22%		
	% of RAS Mixtures Using Softer Binders	100%	100%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			8.6 (Tons, Millions)	6.4 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.8 (Tons, Millions)	3.3 (Tons, Millions)
	DOT	68%	74%	4.6 (Tons, Millions)	3.5 (Tons, Millions)
	Other Agency	57%	55%	3.2 (Tons, Millions)	2.8 (Tons, Millions)
	Commercial & Residential	59%	68%	2.6 (Tons, Millions)	3.4 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	7%	2%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	93%	98%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	58%	89%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

OKLAHOMA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	3.8	5.1	5.1	5.1
	DOT	1.4	2.8	1.9	2.8
	Other Agency	1.5	1.2	2.0	1.2
	Commercial & Residential	0.9	1.1	1.2	1.1
	No. of Companies Reporting	9	10		
RAP (Tons, Millions)	Accepted	1.1	0.8	1.4	0.8
	Used in HMA/WMA Mixtures	0.7	1.0	1.0	1.0
	Used as Aggregate	0.3	0.0	0.4	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	1.20	1.21	1.61	1.21
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	15.8%	15.9%		
	Average % for Other Agency Mixtures[1]	19.1%	19.4%		
	Average % for Commercial & Residential Mixtures[1]	20.4%	22.2%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			18.7%	19.2%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	70%	44%		
	% of RAP Mixtures Using Softer Binders	21%	16%		
	% of RAP Mixtures Using Recycling Agents	15%	10%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	40.0	1.0	53.7	1.0
	Processed Shingles Accepted	10.0	10.0	13.4	10.0
	Used in HMA/WMA Mixtures	26.0	21.0	34.9	21.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	75.2	22.2	100.9	22.2
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.78%	0.50%		
	Average % for Commercial & Residential Mixtures[1]	0.89%	0.93%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.68%	0.41%
RAS (Other Reported Data)	% Companies Reporting Using RAS	33%	30%		
	% of RAS Mixtures Using Softer Binders	75%	75%		
	% of RAS Mixtures Using Recycling Agents	28%	50%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.2 (Tons, Millions)	1.3 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.5 (Tons, Millions)	0.8 (Tons, Millions)
	DOT	53%	42%	1.0 (Tons, Millions)	1.2 (Tons, Millions)
	Other Agency	56%	46%	1.2 (Tons, Millions)	0.6 (Tons, Millions)
	Commercial & Residential	42%	29%	0.5 (Tons, Millions)	0.3 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	12%	7%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	88%	93%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	56%	50%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

OREGON

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	2.1	1.8	5.2	5.5
	DOT	0.5	0.2	1.2	0.7
	Other Agency	0.8	0.7	2.0	2.0
	Commercial & Residential	0.8	0.9	2.0	2.8
	No. of Companies Reporting	5	4		
RAP (Tons, Millions)	Accepted	0.5	0.4	1.3	1.2
	Used in HMA/WMA Mixtures	0.6	0.5	1.4	1.6
	Used as Aggregate	0.0	0.0	0.1	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.94	0.69	2.34	2.05
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	26.0%	27.5%		
	Average % for Other Agency Mixtures[1]	26.4%	27.5%		
	Average % for Commercial & Residential Mixtures[1]	28.2%	29.5%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			26.5%	28.6%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	8%	1%		
	% of RAP Mixtures Using Softer Binders	6%	6%		
	% of RAP Mixtures Using Recycling Agents	10%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.5	0.0	1.5
	Used in HMA/WMA Mixtures	1.6	1.0	4.0	3.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	27.5	9.1	68.1	27.2
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.02%	0.04%		
	Average % for Other Agency Mixtures[1]	0.00%	0.04%		
	Average % for Commercial & Residential Mixtures[1]	0.10%	0.07%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.08%	0.05%
RAS (Other Reported Data)	% Companies Reporting Using RAS	20%	50%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	99%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.7 (Tons, Millions)	0.6 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.2 (Tons, Millions)	1.8 (Tons, Millions)
	DOT	44%	38%	0.5 (Tons, Millions)	0.3 (Tons, Millions)
	Other Agency	47%	44%	0.9 (Tons, Millions)	0.9 (Tons, Millions)
	Commercial & Residential	27%	44%	0.5 (Tons, Millions)	1.2 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	46%	29%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	54%	71%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	100%	75%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

PENNSYLVANIA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	5.9	5.7	17.8	20.0
	DOT	2.8	2.9	8.4	10.2
	Other Agency	0.9	1.0	2.7	3.5
	Commercial & Residential	2.2	1.8	6.6	6.3
	No. of Companies Reporting	10	8		
RAP (Tons, Millions)	Accepted	1.0	1.2	3.1	4.1
	Used in HMA/WMA Mixtures	1.2	1.2	3.5	4.2
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.85	0.88	2.57	3.09
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	16.5%	18.6%		
	Average % for Other Agency Mixtures[1]	15.0%	18.9%		
	Average % for Commercial & Residential Mixtures[1]	22.6%	22.4%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			19.8%	20.9%
RAP (Other Reported Data)	% Companies Reporting Using RAP	90%	100%		
	% of RAP Fractionated	23%	28%		
	% of RAP Mixtures Using Softer Binders	12%	11%		
	% of RAP Mixtures Using Recycling Agents	9%	6%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	29.0	8.0	87.5	28.1
	Processed Shingles Accepted	0.0	2.7	0.0	9.5
	Used in HMA/WMA Mixtures	8.3	16.7	25.0	58.7
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	62.1	5.0	187.4	17.6
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.14%	0.24%		
	Average % for Other Agency Mixtures[1]	0.14%	0.21%		
	Average % for Commercial & Residential Mixtures[1]	0.14%	0.47%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.14%	0.29%
RAS (Other Reported Data)	% Companies Reporting Using RAS	30%	38%		
	% of RAS Mixtures Using Softer Binders	33%	25%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			8.4 (Tons, Millions)	9.9 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			5.4 (Tons, Millions)	8.2 (Tons, Millions)
	DOT	76%	100%	6.4 (Tons, Millions)	10.2 (Tons, Millions)
	Other Agency	81%	94%	2.2 (Tons, Millions)	3.3 (Tons, Millions)
	Commercial & Residential	79%	73%	5.2 (Tons, Millions)	4.6 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	57%	76%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	39%	24%		
	Organic Additive, % of Market	4%	0%		
	% Companies Reporting Using WMA Technologies	90%	88%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

PUERTO RICO

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	NCR	NCR	1.4	1.4
	DOT	NCR	NCR	NCR	NCR
	Other Agency	NCR	NCR	NCR	NCR
	Commercial & Residential	NCR	NCR	NCR	NCR
	No. of Companies Reporting	NCR	NCR		
RAP (Tons, Millions)	Accepted	NCR	NCR	NCR	NCR
	Used in HMA/WMA Mixtures	NCR	NCR	NCR	NCR
	Used as Aggregate	NCR	NCR	NCR	NCR
	Used in Cold-Mix Asphalt	NCR	NCR	NCR	NCR
	Used in Other	NCR	NCR	NCR	NCR
	Landfilled	NCR	NCR	NCR	NCR
	Total Tons of RAP Stockpiled at Year-End	NCR	NCR	NCR	NCR
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	NCR	NCR		
	Average % for Other Agency Mixtures[1]	NCR	NCR		
	Average % for Commercial & Residential Mixtures[1]	NCR	NCR		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			NCR	NCR
RAP (Other Reported Data)	% Companies Reporting Using RAP	NCR	NCR		
	% of RAP Fractionated	NCR	NCR		
	% of RAP Mixtures Using Softer Binders	NCR	NCR		
	% of RAP Mixtures Using Recycling Agents	NCR	NCR		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	NCR	NCR	NCR	NCR
	Processed Shingles Accepted	NCR	NCR	NCR	NCR
	Used in HMA/WMA Mixtures	NCR	NCR	NCR	NCR
	Used as Aggregate	NCR	NCR	NCR	NCR
	Used in Cold-Mix Asphalt	NCR	NCR	NCR	NCR
	Used in Other	NCR	NCR	NCR	NCR
	Landfilled	NCR	NCR	NCR	NCR
	Total Tons of RAS Stockpiled at Year-End	NCR	NCR	NCR	NCR
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	NCR	NCR		
	Average % for Other Agency Mixtures[1]	NCR	NCR		
	Average % for Commercial & Residential Mixtures[1]	NCR	NCR		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			NCR	NCR
RAS (Other Reported Data)	% Companies Reporting Using RAS	NCR	NCR		
	% of RAS Mixtures Using Softer Binders	NCR	NCR		
	% of RAS Mixtures Using Recycling Agents	NCR	NCR		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			NCR	NCR
	Total Tons Produced With WMA Technology at HMA Temperatures			NCR	NCR
	DOT	NCR	NCR	NCR	NCR
	Other Agency	NCR	NCR	NCR	NCR
	Commercial & Residential	NCR	NCR	NCR	NCR
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	NCR	NCR		
	Additive Foaming, % of Market	NCR	NCR		
	Plant Foaming, % of Market	NCR	NCR		
	Organic Additive, % of Market	NCR	NCR		
	% Companies Reporting Using WMA Technologies	NCR	NCR		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

RHODE ISLAND

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	2.2	2.2
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

SOUTH CAROLINA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	3.2	7.1	7.0	7.1
	DOT	2.1	3.8	4.6	3.8
	Other Agency	0.6	0.9	1.3	0.9
	Commercial & Residential	0.5	2.4	1.1	2.4
	No. of Companies Reporting	6	10		
RAP (Tons, Millions)	Accepted	0.9	1.6	2.0	1.6
	Used in HMA/WMA Mixtures	0.7	1.9	1.4	1.9
	Used as Aggregate	0.0	0.0	0.1	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	1.42	1.68	3.11	1.68
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	19.6%	25.4%		
	Average % for Other Agency Mixtures[1]	20.0%	24.2%		
	Average % for Commercial & Residential Mixtures[1]	22.2%	29.5%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			20.5%	26.7%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	27%	63%		
	% of RAP Mixtures Using Softer Binders	28%	10%		
	% of RAP Mixtures Using Recycling Agents	0%	2%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	7.5	16.0	16.4	16.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	3.0	3.2	6.6	3.2
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	15.0	24.5	32.8	24.5
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.09%	0.07%		
	Average % for Other Agency Mixtures[1]	0.09%	0.03%		
	Average % for Commercial & Residential Mixtures[1]	0.09%	0.03%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.09%	0.05%
RAS (Other Reported Data)	% Companies Reporting Using RAS	17%	20%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	100%	10%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.0 (Tons, Millions)	0.5 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.8 (Tons, Millions)	0.3 (Tons, Millions)
	DOT	42%	13%	1.9 (Tons, Millions)	0.5 (Tons, Millions)
	Other Agency	48%	17%	0.6 (Tons, Millions)	0.2 (Tons, Millions)
	Commercial & Residential	30%	3%	0.3 (Tons, Millions)	0.1 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	100%	100%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	83%	70%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

SOUTH DAKOTA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	2.9	3.0
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

TENNESSEE

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	3.8	6.1	8.9	9.5
	DOT	2.1	3.0	4.9	4.7
	Other Agency	0.8	1.8	1.9	2.7
	Commercial & Residential	0.9	1.3	2.1	2.1
	No. of Companies Reporting	7	9		
RAP (Tons, Millions)	Accepted	0.8	1.3	1.8	2.0
	Used in HMA/WMA Mixtures	0.7	1.2	1.7	1.9
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	1.85	1.67	4.32	2.59
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	17.1%	18.5%		
	Average % for Other Agency Mixtures[1]	19.6%	19.9%		
	Average % for Commercial & Residential Mixtures[1]	22.7%	24.5%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			19.0%	20.4%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	34%	63%		
	% of RAP Mixtures Using Softer Binders	22%	17%		
	% of RAP Mixtures Using Recycling Agents	12%	11%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.6	0.0	0.9
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	8.5	0.0	13.2
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	2.6	0.0	4.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.22%		
	Average % for Other Agency Mixtures[1]	0.00%	0.04%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.04%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.14%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	22%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	45%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.4 (Tons, Millions)	0.5 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.9 (Tons, Millions)	0.9 (Tons, Millions)
	DOT	34%	16%	1.7 (Tons, Millions)	0.7 (Tons, Millions)
	Other Agency	15%	15%	0.3 (Tons, Millions)	0.5 (Tons, Millions)
	Commercial & Residential	14%	11%	0.3 (Tons, Millions)	0.2 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	45%	42%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	55%	58%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	57%	33%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

TEXAS

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	5.2	8.7	35.0	44.7
	DOT	2.2	3.9	14.8	20.0
	Other Agency	1.2	2.3	8.1	11.8
	Commercial & Residential	1.8	2.5	12.1	12.9
	No. of Companies Reporting	4	6		
RAP (Tons, Millions)	Accepted	1.0	1.5	6.7	7.8
	Used in HMA/WMA Mixtures	1.0	1.5	6.5	7.8
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.1	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.99	2.14	6.69	11.00
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	18.0%	16.0%		
	Average % for Other Agency Mixtures[1]	19.5%	16.3%		
	Average % for Commercial & Residential Mixtures[1]	21.3%	19.8%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			18.5%	17.5%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	45%	60%		
	% of RAP Mixtures Using Softer Binders	16%	40%		
	% of RAP Mixtures Using Recycling Agents	19%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	33.7	5.3	226.8	27.2
	Processed Shingles Accepted	0.0	3.8	0.0	19.5
	Used in HMA/WMA Mixtures	20.4	12.5	137.3	64.2
	Used as Aggregate	0.0	1.3	0.0	6.7
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	23.5	39.9	158.2	205.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.45%	0.19%		
	Average % for Other Agency Mixtures[1]	0.36%	0.11%		
	Average % for Commercial & Residential Mixtures[1]	0.36%	0.15%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.39%	0.14%
RAS (Other Reported Data)	% Companies Reporting Using RAS	75%	67%		
	% of RAS Mixtures Using Softer Binders	0%	25%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.8 (Tons, Millions)	7.4 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			17.3 (Tons, Millions)	15.6 (Tons, Millions)
	DOT	65%	57%	9.6 (Tons, Millions)	11.4 (Tons, Millions)
	Other Agency	67%	43%	5.4 (Tons, Millions)	5.1 (Tons, Millions)
	Commercial & Residential	34%	50%	4.1 (Tons, Millions)	6.5 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	76%	100%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	24%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	100%	83%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

U.S. VIRGIN ISLANDS

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	NCR	NCR	0.1	0.1
	DOT	NCR	NCR	NCR	NCR
	Other Agency	NCR	NCR	NCR	NCR
	Commercial & Residential	NCR	NCR	NCR	NCR
	No. of Companies Reporting	NCR	NCR		
RAP (Tons, Millions)	Accepted	NCR	NCR	NCR	NCR
	Used in HMA/WMA Mixtures	NCR	NCR	NCR	NCR
	Used as Aggregate	NCR	NCR	NCR	NCR
	Used in Cold-Mix Asphalt	NCR	NCR	NCR	NCR
	Used in Other	NCR	NCR	NCR	NCR
	Landfilled	NCR	NCR	NCR	NCR
	Total Tons of RAP Stockpiled at Year-End	NCR	NCR	NCR	NCR
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	NCR	NCR		
	Average % for Other Agency Mixtures[1]	NCR	NCR		
	Average % for Commercial & Residential Mixtures[1]	NCR	NCR		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			NCR	NCR
RAP (Other Reported Data)	% Companies Reporting Using RAP	NCR	NCR		
	% of RAP Fractionated	NCR	NCR		
	% of RAP Mixtures Using Softer Binders	NCR	NCR		
	% of RAP Mixtures Using Recycling Agents	NCR	NCR		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	NCR	NCR	NCR	NCR
	Processed Shingles Accepted	NCR	NCR	NCR	NCR
	Used in HMA/WMA Mixtures	NCR	NCR	NCR	NCR
	Used as Aggregate	NCR	NCR	NCR	NCR
	Used in Cold-Mix Asphalt	NCR	NCR	NCR	NCR
	Used in Other	NCR	NCR	NCR	NCR
	Landfilled	NCR	NCR	NCR	NCR
	Total Tons of RAS Stockpiled at Year-End	NCR	NCR	NCR	NCR
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	NCR	NCR		
	Average % for Other Agency Mixtures[1]	NCR	NCR		
	Average % for Commercial & Residential Mixtures[1]	NCR	NCR		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			NCR	NCR
RAS (Other Reported Data)	% Companies Reporting Using RAS	NCR	NCR		
	% of RAS Mixtures Using Softer Binders	NCR	NCR		
	% of RAS Mixtures Using Recycling Agents	NCR	NCR		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			NCR	NCR
	Total Tons Produced With WMA Technology at HMA Temperatures			NCR	NCR
	DOT	NCR	NCR	NCR	NCR
	Other Agency	NCR	NCR	NCR	NCR
	Commercial & Residential	NCR	NCR	NCR	NCR
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	NCR	NCR		
	Additive Foaming, % of Market	NCR	NCR		
	Plant Foaming, % of Market	NCR	NCR		
	Organic Additive, % of Market	NCR	NCR		
	% Companies Reporting Using WMA Technologies	NCR	NCR		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

UTAH

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	3.8	2.8	4.3	3.7
	DOT	1.1	0.9	1.2	1.2
	Other Agency	1.4	0.9	1.6	1.1
	Commercial & Residential	1.3	1.0	1.5	1.4
	No. of Companies Reporting	9	7		
RAP (Tons, Millions)	Accepted	0.9	0.6	1.1	0.8
	Used in HMA/WMA Mixtures	1.0	0.8	1.1	1.1
	Used as Aggregate	0.0	0.1	0.0	0.1
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.46	1.08	0.52	1.45
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	22.7%	25.0%		
	Average % for Other Agency Mixtures[1]	19.3%	25.3%		
	Average % for Commercial & Residential Mixtures[1]	35.8%	32.1%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			25.6%	28.7%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	8%	15%		
	% of RAP Mixtures Using Softer Binders	50%	63%		
	% of RAP Mixtures Using Recycling Agents	0%	20%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.9 (Tons, Millions)	1.5 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			2.1 (Tons, Millions)	1.1 (Tons, Millions)
	DOT	83%	75%	1.0 (Tons, Millions)	0.9 (Tons, Millions)
	Other Agency	100%	64%	1.6 (Tons, Millions)	0.7 (Tons, Millions)
	Commercial & Residential	97%	74%	1.4 (Tons, Millions)	1.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	28%	36%		
	Additive Foaming, % of Market	35%	0%		
	Plant Foaming, % of Market	37%	64%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	100%	71%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

VERMONT

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	2.0	2.0
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

VIRGINIA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	7.3	6.6	10.5	11.5
	DOT	3.8	2.7	5.5	4.8
	Other Agency	1.0	1.5	1.4	2.5
	Commercial & Residential	2.5	2.4	3.6	4.2
	No. of Companies Reporting	9	10		
RAP (Tons, Millions)	Accepted	2.7	2.4	3.8	4.2
	Used in HMA/WMA Mixtures	2.3	2.0	3.2	3.5
	Used as Aggregate	0.3	0.0	0.4	0.1
	Used in Cold-Mix Asphalt	0.1	0.0	0.1	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	2.56	2.37	3.68	4.15
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	27.0%	29.9%		
	Average % for Other Agency Mixtures[1]	25.2%	28.1%		
	Average % for Commercial & Residential Mixtures[1]	34.1%	32.4%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			30.8%	30.6%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	31%	29%		
	% of RAP Mixtures Using Softer Binders	13%	22%		
	% of RAP Mixtures Using Recycling Agents	7%	1%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	5.0	0.0	8.8
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			6.9 (Tons, Millions)	7.5 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.3 (Tons, Millions)	3.1 (Tons, Millions)
	DOT	66%	87%	3.6 (Tons, Millions)	4.2 (Tons, Millions)
	Other Agency	61%	95%	0.9 (Tons, Millions)	2.4 (Tons, Millions)
	Commercial & Residential	76%	95%	2.7 (Tons, Millions)	4.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	69%	89%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	31%	11%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	78%	80%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

WASHINGTON

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	5.0	4.6	5.3	6.2
	DOT	1.0	0.5	1.1	0.7
	Other Agency	1.9	1.7	2.0	2.3
	Commercial & Residential	2.1	2.4	2.2	3.2
	No. of Companies Reporting	9	7		
RAP (Tons, Millions)	Accepted	1.4	1.1	1.4	1.4
	Used in HMA/WMA Mixtures	1.2	1.1	1.3	1.4
	Used as Aggregate	0.1	0.1	0.1	0.2
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	1.15	0.73	1.22	0.98
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	22.5%	21.5%		
	Average % for Other Agency Mixtures[1]	21.5%	20.6%		
	Average % for Commercial & Residential Mixtures[1]	26.0%	25.6%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			24.4%	23.3%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	18%	27%		
	% of RAP Mixtures Using Softer Binders	40%	25%		
	% of RAP Mixtures Using Recycling Agents	9%	3%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	14.2	14.3	15.1	19.1
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	8.9	10.5	9.4	14.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	9.5	6.5	10.1	8.7
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.10%	0.15%		
	Average % for Other Agency Mixtures[1]	0.22%	0.20%		
	Average % for Commercial & Residential Mixtures[1]	0.27%	0.38%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.18%	0.23%
RAS (Other Reported Data)	% Companies Reporting Using RAS	33%	43%		
	% of RAS Mixtures Using Softer Binders	33%	73%		
	% of RAS Mixtures Using Recycling Agents	40%	11%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.9 (Tons, Millions)	1.3 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.8 (Tons, Millions)	1.8 (Tons, Millions)
	DOT	41%	29%	0.4 (Tons, Millions)	0.2 (Tons, Millions)
	Other Agency	53%	34%	1.1 (Tons, Millions)	0.8 (Tons, Millions)
	Commercial & Residential	55%	41%	1.2 (Tons, Millions)	1.3 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	9%	10%		
	Additive Foaming, % of Market	3%	0%		
	Plant Foaming, % of Market	88%	90%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	89%	71%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

WEST VIRGINIA

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	0.3	2.1	3.8	3.8
	DOT	0.2	1.8	2.5	3.3
	Other Agency	0.1	0.0	0.7	0.0
	Commercial & Residential	0.0	0.3	0.6	0.5
	No. of Companies Reporting	3	3		
RAP (Tons, Millions)	Accepted	0.2	0.3	2.9	0.5
	Used in HMA/WMA Mixtures	0.1	0.3	0.6	0.6
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.34	0.36	4.33	0.65
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	15.3%	16.5%		
	Average % for Other Agency Mixtures[1]	10.0%	8.0%		
	Average % for Commercial & Residential Mixtures[1]	19.7%	16.6%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			16.7%	16.2%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	0%	0%		
	% of RAP Mixtures Using Softer Binders	0%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	0.0	0.0	0.0
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	0.0	0.0	0.0	0.0
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.00%	0.00%		
	Average % for Other Agency Mixtures[1]	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures[1]	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.00%	0.00%
RAS (Other Reported Data)	% Companies Reporting Using RAS	0%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			0.1 (Tons, Millions)	0.1 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			2.8 (Tons, Millions)	0.1 (Tons, Millions)
	DOT	80%	6%	2.0 (Tons, Millions)	0.2 (Tons, Millions)
	Other Agency	74%	40%	0.5 (Tons, Millions)	0.0 (Tons, Millions)
	Commercial & Residential	77%	6%	0.4 (Tons, Millions)	0.0 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	0%	0%		
	Additive Foaming, % of Market	93%	0%		
	Plant Foaming, % of Market	7%	100%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	67%	33%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

WISCONSIN

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	9.6	8.8	12.0	13.0
	DOT	3.8	5.0	4.8	7.4
	Other Agency	2.9	1.5	3.6	2.3
	Commercial & Residential	2.9	2.3	3.6	3.3
	No. of Companies Reporting	5	3		
RAP (Tons, Millions)	Accepted	2.1	2.0	2.6	2.9
	Used in HMA/WMA Mixtures	2.0	1.8	2.5	2.7
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	2.14	2.70	2.67	4.00
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	18.8%	20.0%		
	Average % for Other Agency Mixtures[1]	20.8%	20.0%		
	Average % for Commercial & Residential Mixtures[1]	22.4%	23.6%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			20.8%	21.0%
RAP (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	24%	5%		
	% of RAP Mixtures Using Softer Binders	11%	20%		
	% of RAP Mixtures Using Recycling Agents	21%	1%		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	49.8	27.5	62.3	40.8
	Processed Shingles Accepted	0.0	30.0	0.0	44.5
	Used in HMA/WMA Mixtures	44.0	35.5	55.0	52.6
	Used as Aggregate	0.0	0.0	0.0	0.0
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.0	0.0	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAS Stockpiled at Year-End	50.7	46.5	63.4	68.9
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	0.46%	0.38%		
	Average % for Other Agency Mixtures[1]	0.46%	0.35%		
	Average % for Commercial & Residential Mixtures[1]	0.47%	0.49%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			0.46%	0.40%
RAS (Other Reported Data)	% Companies Reporting Using RAS	100%	100%		
	% of RAS Mixtures Using Softer Binders	30%	100%		
	% of RAS Mixtures Using Recycling Agents	21%	9%		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			1.5 (Tons, Millions)	1.1 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.7 (Tons, Millions)	1.6 (Tons, Millions)
	DOT	21%	28%	1.0 (Tons, Millions)	2.1 (Tons, Millions)
	Other Agency	28%	16%	1.0 (Tons, Millions)	0.4 (Tons, Millions)
	Commercial & Residential	6%	5%	0.2 (Tons, Millions)	0.2 (Tons, Millions)
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	100%	100%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	100%	100%		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

WYOMING

Material	Sectors	Reported Values		Estimated Values	
		2020	2021	2020	2021
HMA/WMA (Tons, Millions)	Total	*	*	2.3	2.7
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
RAP (Tons, Millions)	Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAP Stockpiled at Year-End	*	*	*	*
RAP (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA[2]			*	*
RAP (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
RAS (Tons, Thousands)	Unprocessed Shingles Accepted	*	*	*	*
	Processed Shingles Accepted	*	*	*	*
	Used in HMA/WMA Mixtures	*	*	*	*
	Used as Aggregate	*	*	*	*
	Used in Cold-Mix Asphalt	*	*	*	*
	Used in Other	*	*	*	*
	Landfilled	*	*	*	*
	Total Tons of RAS Stockpiled at Year-End	*	*	*	*
RAS (Average % Used in Mixtures)	Average % for DOT Mixtures[1]	*	*		
	Average % for Other Agency Mixtures[1]	*	*		
	Average % for Commercial & Residential Mixtures[1]	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA[2]			*	*
RAS (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
WMA	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
WMA Technologies (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

[1] Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

[2] Average percent based on total reported tons of RAP or RAS used in HMA/WMA divided by reported total tons HMA/WMA produced.

NCR = No companies responding

* = Fewer than 3 companies reporting

NATIONAL ASPHALT
PAVEMENT ASSOCIATION

National Asphalt Pavement Association
6406 Ivy Lane, Suite 350
Greenbelt, Maryland 20770-1441
www.AsphaltPavement.org
napa@AsphaltPavement.org
Toll Free: 888-468-6499
Tel: 301-731-4748
Fax: 301-731-4621

Publications
Login at https://member.asphaltpavement.org/Shop/Product-Catalog

12th Annual Asphalt Pavement Industry Survey
IS 138 — Appendix B

ASPHALT
100% RECYCLABLE

NATIONAL ASPHALT PAVEMENT ASSOCIATION

Asphalt Pavement Industry Survey on

Recycled Materials and Warm-Mix Asphalt Usage 2021

IS-138 Appendix C:
Methodology for Calculating Energy and Greenhouse Gas Emission Benefits From Production of WMA and Use of RAP

12th Annual Survey

Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2021 Appendix C

Introduction

Appendix C provides a detailed description of the methodology and assumptions used to calculate energy and greenhouse gas (GHG) emissions reductions from production of WMA at reduced temperature and use of RAP in new asphalt mixtures. These calculations are based on publicly available data published by government agencies, industry, and non-governmental organizations. For many of these calculations, multiple data sources exist for the underlying emission factors. In such cases, the most recent and comprehensive data sources were selected.

Methodology for Calculating Energy and GHG Emissions Reduction from Production of WMA at Reduced Temperature

We start by estimating the expected energy savings (in Btu) associated with mix production at reduced temperature. We then convert the energy savings to an equivalent volume of burner fuel and use emission factors to calculate the cradle-to-combustion GHG emissions reduction associated with producing WMA at reduced temperature. The upstream GHG emissions burdens associated with WMA technologies are then subtracted from the energy related emissions reductions to estimate the net reduction in GHG emissions associated with asphalt mix production at reduced temperature using WMA technologies. Upstream GHG emissions burdens associated with WMA technologies used as a compaction aid (with no temperature reduction) are not accounted for in this calculation.

Temperature Reduction

New for 2021, companies were asked to indicate the quantity of mix produced within three temperature reduction bands; 10° – 30°, 31° – 50°, and 51°F or more (see Table 17). We assume the average reduction in each band is 20°, 40°, and 51°F, respectively. This improved dataset provides a more accurate estimate of the energy and GHG emissions reductions than the conservative (10°F) and optimistic (40°F) scenarios that were previously used. Based on these assumptions, the weighted average temperature reduction achieved among asphalt mix produced at reduced temperature (94.1 million tons) was 23.5°F. The weighted average temperature reduction achieved among all asphalt mix produced in 2021 (432.4 million tons) was 5.1°F.

Energy Savings

NCHRP Report 779 found an estimated energy savings of 1,100 Btu/°F per ton of WMA produced (NASEM, 2014). Here, we use a slightly more conservative value of 1,000 Btu/°F/ton, which is the same value used for NAPA's GHG Calculator tool. Multiplying this value by the production tonnage at reduced temperature and the weighted average temperature reduction yields a total energy savings of 2.2 trillion Btu (Equation 1).

$$94.1\ million\ tons \times 23.5\ °F\ \times \frac{1{,}000\ Btu}{°F \cdot ton} = 2.2\ trillion\ Btu \quad (1)$$

It should be noted that this estimate only accounts for reduced burner fuel combustion and does not account for the electricity savings associated with the improved efficiency of baghouse fans handling WMA exhaust gas at reduced temperature.

Avoided GHG Emissions Associated with Reduced Mix Production Temperature

To estimate avoided GHG emissions associated with reduced mix production temperature, we converted the energy savings (2.2 trillion Btu) into an equivalent volume of fuel using the average blend of fuels consumed by asphalt plants in 2018 and volumetric energy conversion factors (Table C-1) as compiled by Shacat et al. (2022). The emission factors in Table C-1, which represent cradle-to-combusted processes, were then used to calculate the avoided GHG emissions associated with each fuel. Total avoided emissions associated with reduced mix production

temperature, 0.156 million metric tonne (MMT) CO_2e, is the sum of the avoided emissions associated with each fuel type.

A sample calculation for residual fuel oil is provided below.

$$Avoided\ Emissions_{residual\ fuel\ oil}$$
$$= 2.2\ trillion\ Btu \times 1.7\% \times \frac{10^6 MMBtu}{trillion\ Btu} \times \frac{1\ gal}{0.150\ MMBtu} \times \frac{14.45669\ kg\ CO_2e}{gal} \times \frac{1\ MMT}{10^9\ kg}$$
$$= 0.004\ MMT\ CO_2e$$

Table C1: Distribution of Fuels Consumed by Asphalt Plants, Conversion Factors, and Emission Factors[1]

Fuel Type	Percentage of Fuel Consumed by Asphalt Plants	Energy Conversion Factor[2]	Cradle-to-Combusted GWP-100 Emission Factor (kg CO_2e/unit volume)[3]
Residual Fuel Oil	1.7%	0.150 MMBtu/gal	14.45669
Diesel Fuel	13.6%	0.137 MMBtu/gal	12.25099
Natural Gas	69.5%	1.04 MMBtu/MCF	66.65169
Propane	5.1%	0.086 MMBtu/gal	7.879875
Used Oil	10.2%	0.143 MMBtu/gal	10.50072

[1] The information in Table C-1 is derived from Shacat et al. (2022) and references therein.

[2] MMBtu is million Btu. MCF is thousand cubic feet.

[3] GWP-100 is the global warming potential over a 100-year time horizon. Emission factors include extraction, processing, transportation, and combustion processes for each fuel (cradle-to-combusted).

The emissions reduction calculations described above improve upon the methodology from previous years in three ways:

- The survey now provides an estimate of actual temperature reductions achieved during mix production, rather than relying on conservative and optimistic scenarios.
- Estimates are provided for the types and relative amounts of burner fuel consumed by asphalt plants rather than assuming the use of natural gas as a burner fuel across the board.
- The updated cradle-to-combusted emission factors are consistent with the GHG Emissions Inventory for Asphalt Mixture Production in the U.S. (Shacat et al., 2022) and environmental product declarations (EPDs) for asphalt mixtures.

The emissions reduction calculations would be further improved if reliable estimates of electricity savings associated with the improved efficiency of baghouse fans handling WMA exhaust gas at reduced temperature were available.

WMA GHG Burdens – General Considerations

WMA production requires the use of additional materials, such as water or chemical additives, that are not typically used for asphalt mixture production. GHG emissions associated with extracting, processing, and transporting those materials are referred to as the upstream WMA GHG burdens. The magnitude of these burdens depends on the type of WMA technology used and application-specific parameters. For foamed asphalt WMA technologies, the primary upstream GHG burden is associated with extracting, treating (if applicable), and delivering water to the facility. For chemical and organic additives, the upstream GHG burdens stem from extracting, processing, and transporting the chemical or organic additives to the asphalt plant.

GHG Burdens from Foamed Asphalt Water Consumption

Foamed asphalt consumes approximately 1-2 percent water by weight of virgin asphalt binder. For this analysis, we use a conservative estimate of 2 percent. If we assume the average binder content of foamed asphalt WMA mixtures is 5 percent, approximately 36,700 tons of water are consumed to produce WMA at reduced temperature. This can be converted to 11.0 million gallons (MG) assuming 8.33 lbs of water per gallon.

To our knowledge, no Federal agencies have published nationwide data regarding the carbon footprint of supplying water. However, Griffiths-Sattenspiel and Wilson (2009) provide a sector-specific analysis of water consumption and related greenhouse gas emissions. Based on the data reported by Griffiths-Sattenspiel and Wilson (2009), municipal water supply has the highest carbon intensity at 1.25 tonne CO_2e/MG water. Industrial and mining water supplies have carbon intensities of 0.33 and 0.25 tonne CO_2e/MG water, respectively. Information on which type of water supply asphalt plants use is not collected in the industry survey, but it's likely a mix of municipal, industrial, and mining water supply sources. For this report, we use the more conservative estimate for municipal water supply carbon intensity, which likely over-estimates the carbon intensity for supplying water to asphalt plants, perhaps by as much as a factor of four or five.

The GHG burden for supplying water for foamed WMA produced at reduced temperature is estimated to be 11 tonne CO_2e/year, which is less than a tenth of a percent of the most conservative estimate of GHG emissions reduction for WMA produced at reduced temperature. Thus, the upstream GHG burdens for foamed water consumption are negligible.

GHG Burdens from Chemical and Organic Additives

Estimating the upstream emissions for producing chemical and organic WMA additives is more complex than doing so for water. There are numerous suppliers for these additives, each of which uses different chemical compositions and proprietary manufacturing processes, with dosage rates that vary by type of additive and application-specific parameters. Collecting the necessary data to constrain these variables would be a substantial effort and is outside the scope of this survey. Some WMA additives are used for other purposes, such as anti-strip or recycling agents, and the WMA functionality is a co-benefit, creating additional challenges with respect to allocation of burdens to WMA.

Even if the types and quantities of WMA additives could be estimated, there is very little publicly available information about the upstream GHG emissions associated with manufacturing and transporting WMA additives. To our knowledge, the only publicly available data that offers insight into the upstream GHG burdens for WMA additives is the EPD for Evotherm M1 published by Ingevity (2021). We developed a scenario that uses Ingevity's Evotherm M1 as a proxy for all WMA chemical additives used to produce mix at reduced temperature. Although this scenario is not realistic, it provides a rough estimate of the upstream WMA GHG burdens associated with the use of chemical additives to reduce mix production temperatures.

Assuming a 5 percent binder content for WMA produced at reduced temperature using a chemical additive and a dosage rate of 0.5 percent Evotherm M1 by weight of binder, 14,021 tons of WMA additive would be needed if Evotherm M1 were the only chemical additive used to reduce mix production temperatures. Using Ingevity's published value of 5.99 kg CO_2e/kg Evotherm M1, the upstream GHG emissions would be 0.076 MMT CO_2e. Subtracting this number from the 0.156 MMT of avoided emissions results in a net emissions reduction of 0.080 MMT CO_2e.

GHG burdens from use of organic additives and additive foaming were not calculated due to a lack of upstream data. However, these technologies only accounted for 1.1% 0.3%, respectively, of mix produced at reduced temperatures in 2021. The GHG burdens associated with these technologies are therefore likely to be small.

The following information would allow for a more accurate estimate of upstream WMA GHG emissions:

- Characterization and quantification of the types and amounts of chemical and organic WMA additives that are used,
- More robust data regarding the upstream GHG emissions for commonly used WMA additives, and
- Development of an allocation procedure to address co-benefits of WMA additives such as anti-strip and recycling agent functionalities.

Methodology for Calculating GHG Emissions Reduction from Use of RAP in New Asphalt Mixtures

GHG emissions reduction from use of RAP in new asphalt mixtures is quantified by estimating the avoided upstream emissions that would be associated with extracting, processing, and transporting virgin materials (aggregate and

asphalt binder) that the RAP replaces in asphalt mixtures. To quantify the GHG emissions burdens from using RAP, the emissions associated with transporting and processing RAP are estimated. Considerations regarding the use of recycling agents and softer binders is also discussed. This approach relies on several assumptions to address the impacts of recycled and secondary materials from an emissions accounting perspective:

- Emissions associated with materials production, transportation, construction, maintenance, use, and end-of-life (including milling or excavation) of the original pavement from which the RAP was sourced are outside the system boundary and are not included in this analysis. This cut-off method for recycled materials is consistent with Mukherjee (2021) and the Product Category Rules (PCR) for Asphalt Mixtures (NAPA, 2022).
- The average asphalt binder content of RAP is 5 percent, consistent with calculations used elsewhere in this report. The asphalt binder in the RAP is completely mixed and utilized, allowing for a comparable reduction in the use of virgin asphalt binder.
- The use of RAP does not significantly affect asphalt plant energy consumption and related GHG emissions.

The following changes were made to the calculation methodology relative to previous years due to the availability of more recent data and to be consistent with the Emissions Inventory Report for U.S. Asphalt Mixture Production (Shacat et al., 2022):

- We revised the emission factors for virgin aggregate production from 4.258 to 1.761 kg CO_2e/ton, for truck transport from 0.202497 to 0.185465 kg CO_2e/ton·mile, and for diesel fuel combustion from 12.16 to 12.25 kg CO_2e/gal.
- We revised the average RAP transport distance from 50 miles to 33 miles.

A detailed discussion of the calculation methodology is provided below.

GHG Emission Reduction from Avoided Use of Asphalt Binder

Starting with an estimated 94.6 million tons of RAP utilized in asphalt mixtures, approximately 4.73 million tons of virgin asphalt binder is avoided, assuming an average binder content of 5 percent.

Several studies have estimated the carbon footprint associated with extracting, processing, and transporting virgin asphalt binder, and the differences between them are substantial. For this analysis, we use an estimate of 577.9 kg CO_2e/ton as published in the Asphalt Institute's Life Cycle Assessment (LCA) of Asphalt Binder (Wildnauer et al., 2019), which relies on a thermodynamic allocation approach for refinery operations and a bottom-up approach for crude slate allocation based on refinery data specific to asphalt binder production. The LCA of Asphalt Binder also includes the emissions associated with terminal operations, which is not included in other available datasets. The avoided GHG emissions from asphalt binder replacement through the use of RAP is estimated to be 2.73 million tonne CO_2e.

GHG Emissions Reduction from Avoided Use of Aggregates

Starting with an estimated 94.6 million tons of RAP utilized in asphalt mixtures, approximately 89.87 million tons of virgin aggregate is avoided, assuming an average aggregate content of 95 percent.

For the carbon footprint of crushed stone extraction and processing, we used 1.761236 kg CO_2e/ton, which is the same value used by Shacat et al. (2022). Multiplying this by the mass of avoided virgin aggregate, the avoided GHG emissions from aggregate replacement through the use of RAP is approximately 0.16 million tonne CO_2e.

GHG Emissions Reduction from Avoided Transportation of Asphalt Binder and Aggregates

The emission factors for asphalt binder and aggregates are based on a cradle-to-gate scope, which does not include transportation to the asphalt plant. To estimate the avoided emissions for transporting asphalt binder and aggregates to the asphalt plant, we assume the average haul distance for virgin asphalt binder and aggregates to be 3.9 and 21.5 ton·miles/ton of mix produced, respectively (Mukherkee, 2016). Using the total RAP quantity of 94.6 million tons as the basis for the amount of virgin mix offset by the use of RAP, this yields a combined of 2.40 billion ton·miles of avoided transport.

We used an emission factor for transportation by diesel powered combination truck of 0.185465 kg CO_2e /ton·mile, consistent with Shacat et al. (2022) and references therein. This emission factor is multiplied by the estimate of 2.40 billion ton·miles of avoided transport to yield a GHG emission reduction of approximately 0.45 million tonne CO_2e.

GHG Emissions Burdens from Use of RAP – General Considerations

Potential GHG emission burdens from use of RAP include a variety of factors, the most straightforward of which are the emissions associated with transporting and processing RAP. For this report, the system boundary begins with transportation of RAP. Activities that occur prior to transportation, such as milling or excavation, are considered part of the end-of-life of phase for the previous pavement and are not included in this estimate.

GHG Emission Burdens from RAP Processing

RAP is often processed by crushing and screening prior to use in asphalt mixture production to improve the quality and consistency of the finished product. The energy required to process the RAP is estimated to be 0.1 gallons of distillate fuel per ton of RAP processed (Mukherjee 2016). Approximately 9.46 million gallons of distillate fuel oil are consumed to process 94.6 million tons of RAP. Using an emission factor of 12.25 kg CO_2e per gallon of distillate fuel oil (Shacat et al., 2022), GHG emissions from RAP processing are estimated to be approximately 0.12 MMT CO_2e. This estimate assumes that all RAP is processed prior to use, and the processing equipment is powered by a diesel engine.

GHG Emission Burdens from Transportation of RAP

Transportation of RAP from the jobsite to the asphalt plant is included in the system boundary. To estimate the emissions for transporting RAP to the asphalt plant, we assume the average haul distance for RAP to be 33 miles, which is based on an industry survey described by Shacat et al. (2022). The 33-mile haul distance is multiplied by 94.6 million tons to yield 3.12 billion ton·miles. Using the emission factor of 0.185465 kg CO_2e/ton·mile, GHG emissions for transporting RAP to the plant are estimated to be approximately 0.58 million tonne CO_2e.

GHG Emission Burdens from Use of Softer Binders and Recycling Agents

Asphalt plants sometimes use recycling agents or softer binders to improve the quality of asphalt mixtures that contain RAP. On average, survey respondents reported that 22% of RAP mixes used a softer binder and 5% of RAP mixes used a recycling agent in 2021 (Table 8). Specific data regarding the PG grade of binders used and the types and quantities of recycling agents used are not collected in the survey. Additionally, there is no publicly available data regarding the carbon footprint of specific binder grades or recycling agents. The data provided in the Asphalt Institute's LCA of Asphalt Binder (Wildnauer et al., 2019) is an average of all asphalt binder produced and does not provide separate values for different PG grades. Thus, GHG emission burdens from use of softer binders and recycling agents are not estimated in this report.

References

Griffiths-Sattenspiel, B. & W. Wilson (2009). *The Carbon Footprint of Water*. River Network, Portland, Oregon. https://www.csu.edu/cerc/researchreports/documents/CarbonFootprintofWater-RiverNetwork-2009.pdf

Ingevity (2021). Environmental Product Declaration, Evotherm M1.Ingevity Corporation, North Charleston, South Carolina. https://www.ingevity.com/products/evotherm/.

Mukherjee, A. (2016). *Life Cycle Assessment of Asphalt Mixtures in Support of an Environmental Product Declaration*. National Asphalt Pavement Association, Lanham, Maryland.

NASEM (2014). *Field Performance of Warm Mix Asphalt Technologies.* Washington, DC: The National Academies Press. doi:10.17226/22272.

Shacat, J., J.R. Willis, and B. Ciavola (2022). GHG Emissions Inventory for Asphalt Mix Production in the United States, SIP-106. National Asphalt Pavement Association, Greenbelt, Maryland. https://www.asphaltpavement.org/uploads/documents/Sustainability/SIP-106_GHG_Emissions_Inventory_for_Asphalt_Mix_Production_in_the_US_%E2%80%93_NAPA_June_2022.pdf.

Wildnauer, M., E. Mulholland, & J. Liddie (2019). *Life Cycle Assessment of Asphalt Binder*. Asphalt Institute, Lexington, Kentucky. http://www.asphaltinstitute.org/engineering/lca-study-on-asphalt-binders/

NATIONAL ASPHALT
PAVEMENT ASSOCIATION

National Asphalt Pavement Association
6406 Ivy Lane, Suite 350
Greenbelt, Maryland 20770-1441
www.AsphaltPavement.org
napa@AsphaltPavement.org
Toll Free: 888-468-6499
Tel: 301-731-4748
Fax: 301-731-4621

Publications
Login at https://member.asphaltpavement.org/Shop/Product-Catalog

12th Annual Asphalt Pavement Industry Survey
IS 138 — Appendix C

ASPHALT
100% RECYCLABLE