

# Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage 2022

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Information Series 138

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<b>16. Abstract</b> <p>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.</p> <p>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.</p> <p>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.</p> <p>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 22.2 percent in 2022. In 2022, the estimated RAP tonnage used in asphalt mixtures was 98.1 million tons. This represents 4.9 million tons (26.9 million barrels) of asphalt binder conserved, along with the replacement of more than 93 million tons of virgin aggregate. The use of RAS in asphalt pavement mixtures has decreased from 701,000 tons in 2009 to an estimated 673,000 tons in 2022 with the use of RAS increasing (7 percent) from 2021 to 2022.</p> <p>The combined savings of asphalt binder and aggregate from using RAP and RAS in asphalt mixtures is estimated at more than \$4.7 billion and more than 68 million cubic yards of landfill space.</p> <p>More than 834,000 tons of other recycled materials were reported as being incorporated into about 8.8 million tons of asphalt pavement mixtures during the 2022 construction season, including recycled tire rubber, blast furnace slag, steel slag, and cellulose fibers.</p> <p>The estimated total production of asphalt with WMA technologies during the 2022 construction season was 175.0 million tons of which about 59 percent was produced at reduced temperatures. This was a 1.6 percent decrease from the estimated 177.9 million tons of WMA in 2021. Utilization of WMA technologies in 2022 was 942 percent more than the estimated 16.8 million tons in the 2009 construction season.</p> <p>Asphalt produced with WMA technology made up 39.6 percent of the total estimated asphalt mixture market in 2022. Chemical additive technologies, representing 64 percent of the market, is the most commonly used warm-mix technology; production plant foaming accounted for nearly 34 percent of the market. Differences were seen in which WMA technologies were used when production temperatures were or were not reduced.</p>					
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# Table of Contents

Table of Contents .....	4
List of Abbreviations .....	6
Executive Summary.....	7
Reclaimed Asphalt Pavement .....	7
Reclaimed Asphalt Shingles.....	8
Other Findings .....	8
Warm-Mix Asphalt Technologies .....	8
Background .....	9
Objective and Scope.....	10
Survey Methodology .....	10
Producer Survey Results .....	10
Data Summary and National Estimates .....	14
Total Asphalt Mixture Production.....	16
Reclaimed Asphalt Pavement .....	17
RAP Use by Sector .....	18
RAP Use in Each State .....	19
RAP Stockpiles .....	21
RAP Fractionation.....	22
RAP Recycling Agent Use.....	23
Reclaimed Asphalt Shingles .....	24
RAS Use by Sector .....	25
RAS Use in Each State.....	29
RAS Stockpiles .....	29
RAS Recycling Agent Use.....	30
The Importance of Engineering Recycled Asphalt Mixtures for Quality .....	31
Cost Savings from RAP and RAS .....	31
Warm-Mix Asphalt Technology.....	32
WMA Technology Use by Sector.....	33
WMA Technology Use in Each State .....	34
WMA Technologies .....	35
Use of WMA Technologies at Different Temperatures.....	36
Energy and Greenhouse Gas Emission Benefits from WMA and RAP .....	37
Energy and GHG Emission Benefits from Production of WMA at Reduced Temperature .....	37
GHG Emissions Benefits from Use of RAP .....	38
Other Recycled Materials.....	40
Recycled Tire Rubber .....	40
Steel & Blast Furnace Slag.....	41
Recycled Fibers.....	43
Coal Combustion Products.....	44
Other Recycled Materials.....	45
In-place Recycling.....	46
In-Place Recycling Use by User Producer Group Region.....	46

Historical Trends ..... 47

Summary and Conclusions ..... 48

    Reclaimed Asphalt Pavement ..... 49

    Reclaimed Asphalt Shingles ..... 49

    Material Cost Savings ..... 50

    Other Recycled Materials..... 50

    Warm Mix Asphalt ..... 50

    Conclusions ..... 51

References ..... 51

Methodology & Survey Forms ..... Appendix A

State-by-State Use of Recycled Materials and Warm-Mix Asphalt in Asphalt Pavement Mixtures..... Appendix B

Methodology for Calculating Energy and Greenhouse Gas Emission Benefits From Production of WMA and Use of RAP  
..... Appendix C

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## 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
CRM	Crumb Rubber Modifier
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
OGFC	Open-Graded Friction Course
PCAS	Post-Consumer Asphalt Shingles
PCCAS	Pacific Coast Conference on Asphalt Specifications
RAP	Reclaimed Asphalt Pavement
RAS	Reclaimed Asphalt Shingles
RBR	Recycled Binder Ratio
RMA	Rubber Manufacturers Association
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: 2022

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## Executive Summary

The results of the asphalt pavement industry survey for the 2022 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 2022 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 2022 construction season survey. A total of 235 companies and 1,305 production plants were represented in the survey. Comparing the 2022 results to 2021 construction season, estimated total asphalt mixture production saw an increase to 441.9 million tons from 432.4 million tons, a 2 percent increase.

A degree of fluctuation in year-to-year comparisons of data is influenced by which companies responded to the 2022 construction season survey versus prior year survey respondents. Respondents to the 2022 construction season survey decreased by 26 companies compared to 2021. Of the companies responding to the 2022 survey, 40 did not respond to the 2021 construction season survey.

The following are highlights of the survey of usage during the 2022 construction season:

### ***Reclaimed Asphalt Pavement***

- Asphalt mixture producers remain the country's most diligent recyclers, with more than 93 percent of asphalt mixture reclaimed from old asphalt pavements being put back to use in new asphalt pavements and the remaining 7 percent being used in other civil engineering applications, such as unbound aggregate bases.
- The total estimated tons of RAP used in asphalt mixtures was 98.1 million tons in 2022. This represents a 75.2 percent increase from the total estimated tons of RAP used in 2009. Since 2009, total asphalt mixture tonnage has increased by only 23.3 percent.
- The percentage of producers reporting use of RAP was 100 percent of respondents, which matched 2021. Four producers reported landfilling a minor amount (100,000 tons, or 0.2 percent) of RAP during 2022.
- RAP usage during the 2022 construction season is estimated to have reduced the need for 4.9 million tons (26.9 million barrels) of asphalt binder and more than 93 million tons of aggregate with a total estimated value of more than \$4.6 billion.
- The total estimated amount of RAP stockpiled nationwide at the end of the 2022 construction season was about 154 million tons.
- Fractionated RAP represents about 20 percent of RAP use nationwide, and the tons of RAP mixtures produced using softer binders are estimated at 18 percent while tons produced using recycling agents is estimated at 7 percent.

- Reclaiming 112 million tons of RAP for future use saved about 68.2 million cubic yards of landfill space, and more than \$5.7 billion in gate fees for disposal in landfills.
- The use of RAP in new asphalt mixtures reduced greenhouse gas emissions in 2022 by 2.7 million metric tons of CO<sub>2e</sub>, which is equivalent to the annual emissions of 600,000 passenger vehicles.

### ***Reclaimed Asphalt Shingles***

- The total estimated tons of RAS used in asphalt mixtures increased 7 percent to an estimated 673,000 tons in 2022. The slight increase in the use of RAS reported during the 2022 construction season still leaves utilization at about 65 percent below the 2014 peak level of reported usage.
- The total estimated amount of RAS stockpiled nationwide at the end of the 2022 construction season was about 1.43 million tons, a 26 percent increase from 2021.
- RAS usage during the 2022 construction season is estimated to have reduced the need for 134,000 tons (more than 740,000 barrels) of asphalt binder and about 336,000 tons of aggregate with a total estimated value of more than \$99 million.
- Reclaiming 641,000 tons of unprocessed RAS for future use saved about 390,000 cubic yards of landfill space, and more than \$37 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 2022 construction season were recycled tire rubber, blast furnace slag, steel slag, cellulose fibers, and fly ash.
- More than 834,000 tons of other recycled materials was reported as being used in 8.8 million tons of asphalt mixtures by 64 companies in 31 states during the 2022 construction season.

### ***Warm-Mix Asphalt Technologies***

- The estimated total tonnage of asphalt pavement mixtures produced with WMA technologies for the 2022 construction season was 175.0 million tons. This was a 1.6 percent decrease from the estimated 177.9 million tons of WMA in 2021, led by decreased WMA tonnage in the Commercial & Residential sector.
- Mixtures produced with WMA technologies made up 39.6 percent of the total estimated asphalt mixture market in 2022. About 59.4 percent (103.9 million tons) of these mixtures were produced with a temperature reduction of at least 10°F.
- Production plant foaming, representing nearly 34 percent of the market in 2022, a decrease from their use (about 64.8 percent) in the 2011 construction season.
- Chemical additive technologies accounted for 64 percent of the market in 2022, an increase from their use (60 percent) in the 2021 construction season.
- About 61 percent of survey respondents produce asphalt with WMA technologies; 144 producers in 44 states reported using WMA technologies.
- The use of WMA technologies to produce asphalt mixture at reduced temperatures reduced greenhouse gas emissions in 2022 by 0.18 million metric tons of CO<sub>2e</sub>, which is equivalent to the annual emissions of 40,000 passenger vehicles.



# Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2022

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## 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 2022 construction season, including the results, trends, and changes from 2009 through 2022. 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 September 2023, 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 2022 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

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Asphalt mixture producers from 50 states, and the District of Columbia completed the survey for the 2022 construction season. A total of 235 companies and a total of 1,305 production plants are represented in the 2022 survey. The reported total asphalt mixture tons for 2022 was 191.9 million tons, and the average tons produced per plant increased from 2021 levels to be in line with the 2019 average.

A degree of fluctuation in year-to-year comparisons of data is influenced by which companies responded to the 2022 construction season survey versus prior-year survey respondents.

In the 2022 construction season survey, there was a 10 percent decrease in the total number of responding companies and a 6 percent decrease in the number of plants. Additionally, 16 percent of companies and 12 percent of plants that responded in 2022 did not participate in the 2021 survey. About 5.5 percent of responding companies, representing about 1.7 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 2022 Construction Season Survey in Each State/Territory**

State	Cos.	Prod. Plants	State	Cos.	Prod. Plants	State	Cos.	Prod. Plants
Alabama	4	38	Kentucky	8	51	Ohio	12	69
Alaska	*	*	Louisiana	*	*	Oklahoma	7	27
American Samoa	NCR	NCR	Maine	3	16	Oregon	3	21
Arizona	*	*	Maryland	6	14	Pennsylvania	8	51
Arkansas	7	21	Massachusetts	4	23	Puerto Rico	NCR	NCR
California	4	45	Michigan	9	51	Rhode Island	*	*
Colorado	5	16	Minnesota	6	42	South Carolina	8	35
Connecticut	*	*	Mississippi	3	24	South Dakota	*	*
Delaware	*	*	Missouri	5	27	Tennessee	8	33
District of Columbia	*	*	Montana	*	*	Texas	4	54
Florida	4	38	Nebraska	*	*	U.S. Virgin Islands	NCR	NCR
Georgia	5	50	Nevada	*	*	Utah	6	13
Guam	NCR	NCR	New Hampshire	*	*	Vermont	*	*
Hawaii	*	*	New Jersey	3	17	Virginia	12	51
Idaho	6	21	New Mexico	*	*	Washington	6	23
Illinois	16	42	New York	9	50	West Virginia	3	15
Indiana	6	41	North Carolina	10	89	Wisconsin	4	74
Iowa	3	11	North Dakota	*	*	Wyoming	*	*
Kansas	3	19	No. Mariana Islands	NCR	NCR	<b>Total†</b>	235	1305

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, 2009–2022**

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
2022	51	235	1,305	147,000

Table 3 includes state-by-state 2022 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 43 percent of the estimated total tons for the 2022 construction season.

**Table 3: Summary of 2022 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	3.8	55%	Montana	4.4	*	*
Alaska	5.3	*	*	Nebraska	3.0	*	*
American Samoa	0.02	NCR	NCR	Nevada	3.7	*	*
Arizona	7.8	*	*	New Hampshire	1.6	*	*
Arkansas	6.0	2.9	48%	New Jersey	10.0	3.8	38%
California	26.6	9.3	35%	New Mexico	3.9	*	*
Colorado	9.4	2.4	25%	New York	18.5	5.8	30%
Connecticut	5.2	*	*	North Carolina	13.0	12.4	96%
Delaware	1.6	*	*	North Dakota	2.6	*	*
District of Columbia	1.5	*	*	No. Mariana Isl.	0.02	NCR	NCR
Florida	19.0	8.0	42%	Ohio	18.0	10.2	57%
Georgia	14.1	6.9	49%	Oklahoma	5.2	3.5	67%
Guam	0.1	NCR	NCR	Oregon	5.4	2.9	53%
Hawaii	1.0	*	*	Pennsylvania	21.5	7.3	34%
Idaho	3.0	1.8	61%	Puerto Rico	1.4	NCR	NCR
Illinois	14.7	6.7	46%	Rhode Island	2.2	*	*
Indiana	14.5	7.0	49%	South Carolina	7.4	5.0	67%
Iowa	3.9	1.2	31%	South Dakota	2.9	*	*
Kansas	4.0	2.5	62%	Tennessee	9.2	3.5	38%
Kentucky	7.0	6.2	88%	Texas	52.5	8.3	16%
Louisiana	7.8	*	*	U.S. Virgin Isl.	0.1	NCR	NCR
Maine	2.0	1.9	93%	Utah	4.2	1.9	46%
Maryland	6.5	2.8	43%	Vermont	2.0	*	*
Massachusetts	7.0	3.5	50%	Virginia	12.0	6.7	56%
Michigan	15.0	11.8	78%	Washington	6.1	3.2	52%
Minnesota	9.5	9.1	96%	West Virginia	3.6	1.9	53%
Mississippi	5.8	3.1	54%	Wisconsin	11.5	9.5	82%
Missouri	8.0	3.3	42%	Wyoming	2.6	*	*
				<b>Total</b>	441.9	191.9 <sup>†</sup>	43%

**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

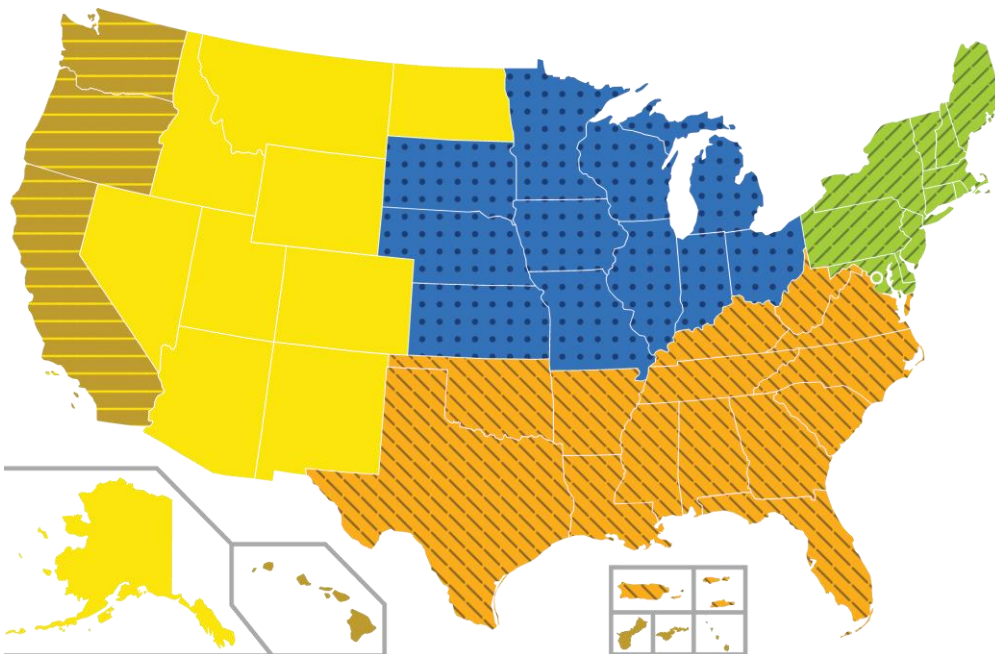
Numbers do not add up exactly due to rounding

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 2021 to 2022 apart from the North East Asphalt User/Producer Group (NEAUPG) region increasing by 10 facilities. The Rocky Mountains Asphalt User/Producer Group (RMAUPG) and Pacific Coast Conference on Asphalt Specification (PCCAS) region saw a decrease in tonnage produced per plant during the 2022 construction season while the North East Asphalt User/Producer Group (NEAUPG), North Central Asphalt User/Producer Group (NCAUPG), and South East Asphalt Asphalt User/Producer Group (SEAUPG) 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
2022	212	142,000

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
2022	381	162,000

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
2022	534	138,000



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	
2022	178	148,000	

Figure 1: Number of Production Plants Responding to Survey by User/Producer Group Region and Estimated Tonnage Per Plant, 2009–2022

# Data Summary and National Estimates

Table 4: Summary of RAP, RAS, WMA Data

NATIONAL SUMMARY					
Material	Sectors	Reported Values		Estimated Values	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	198.1	191.9	432.4	441.9
	DOT	78.7	74.0	171.8	170.5
	Other Agency	53.9	53.5	117.6	123.2
	Commercial & Residential	65.5	64.3	143.1	148.2
	No. of Companies Reporting	261	235		
<b>RAP</b> (Tons, Millions)	Accepted	48.3	50.7	101.3	112.6
	Used in HMA/WMA Mixtures	45.9	44.4	94.6	98.1
	Used as Aggregate	2.0	2.0	4.2	5.8
	Used in Cold-Mix Asphalt	0.1	0.1	0.1	0.1
	Used in Other	0.1	0.3	0.2	0.8
	Landfilled	0.04	0.10	0.1	0.2
	Total Tons of RAP Stockpiled at Year-End	59.82	63.12	137.5	154.6
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	20.8%	20.9%		
	Average % for Other Agency Mixtures <sup>1</sup>	20.8%	20.7%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	25.1%	25.0%		
	National Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			21.9%	22.2%
<b>RAP</b>	No. of Companies Reporting Using RAP	261	235		
<b>RAS</b> (Tons, Thousands)	Unprocessed PCAS Shingles Accepted	105	210	230	483
	Unprocessed MWAS Shingles Accepted	76	69	165	158
	Processed Shingles Accepted	176	154	385	356
	Used in HMA/WMA Mixtures	289	292	630	673
	Used as Aggregate	1	0	3	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	519	621	1,132	1,430
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.115%	0.169%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.133%	0.129%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.174%	0.170%		
	National Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.146%	0.152%
<b>RAS</b>	No. of Companies Reporting Using RAS	65	50		
<b>WMA Technologies</b>	Total Tons Produced With WMA Technology at Reduced Temperature			94.1	103.9
	Total Tons Produced With WMA Technology at HMA Temperatures			83.8	71.1
	DOT	42.5%	46.6%	73.0	79.4
	Other Agency	38.3%	40.7%	45.1	50.2
	Commercial & Residential	41.8%	30.7%	59.8	45.5
	No. of Companies Reporting Using WMA Technologies	161	144		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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 2022 construction season survey alongside data from the 2021 construction season survey (Williams et al., 2022) 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.



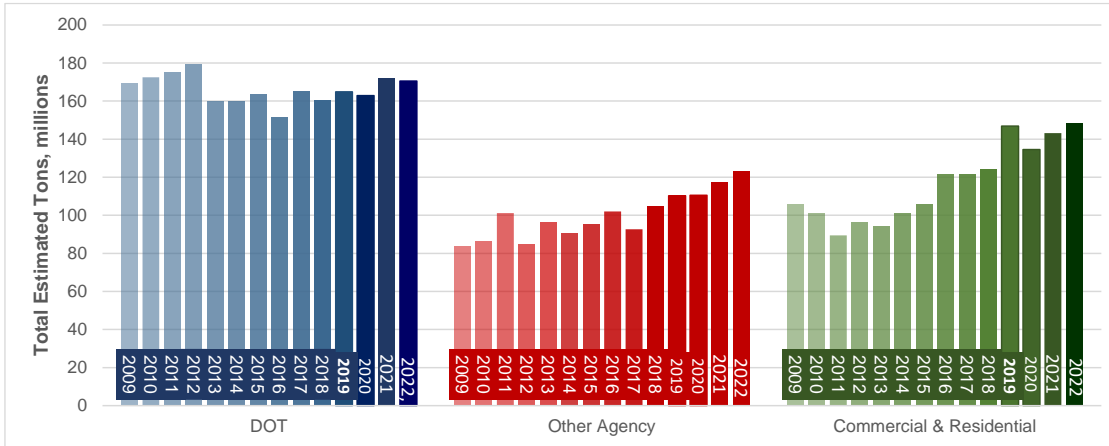
For the amount of RAP accepted, asphalt mixture producers were asked “How many tons of removed asphalt pavement and asphalt millings were accepted/delivered to your facilities in the state in 2022?” For the amount of RAS accepted, producers were asked “How many tons of shingles were accepted/delivered to your facilities in the state in 2022?” 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.

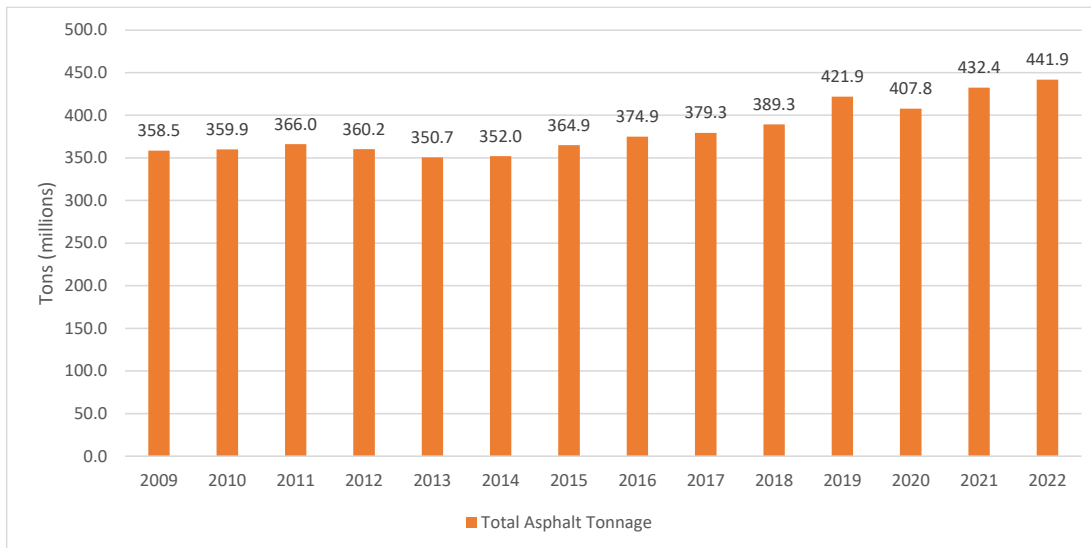
To understand the average percentage of recycled material used in mixtures, producers were asked to report the percent of RAP or RAS averaged across all asphalt mixtures produced for each sector (DOT, Other Agency, Commercial & Residential). If precise data were not available, respondents were asked 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, 2009–2022**



**Figure 2b: Estimated Total Asphalt Mixture Production in Total, 2009–2022**

Table 4 includes the national summary of asphalt mixture production data from the 2021 and 2022 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 2021 to 2022, the estimated total amount of asphalt mixture produced in the United States increased from 432.4 million tons to 441.9 million tons, an increase of 2 percent.

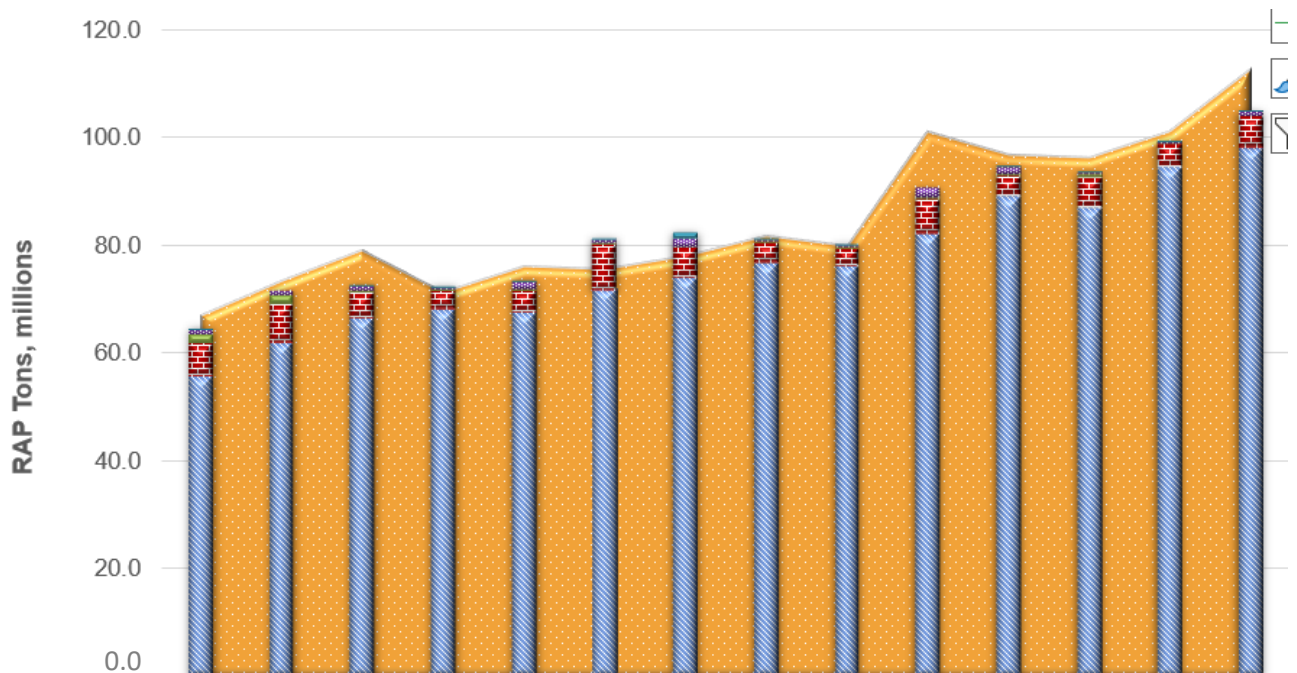
Asphalt pavement mixture producers’ customers can be divided into two broad sectors: the private sector (Commercial & Residential) and the public sector (DOT or Other Agency). The “Other Agency” sector includes asphalt pavement mixtures produced for public works agencies; toll authorities; and city, 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 2021 construction season, 2022 asphalt mixture tonnage produced for the DOT sector decreased 0.8 percent, mixture production for the Other Agency sector increased by 4.8 percent, and the Commercial and Residential sector increased 3.6 percent from 2021 to 2022.

# Reclaimed Asphalt Pavement

Table 4 includes the national summary of RAP data from the 2021 and 2022 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 2022 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 2021 to 2022 construction season, the amount of RAP used in HMA/WMA increased from 94.6 million to 98.1 million tons. The average percent RAP used in asphalt mixtures increased to 22.2 percent in 2022 from 21.9 percent in 2021. For 2022, 100 percent of companies responding to the survey reported using RAP. This matched the 100 percent of companies reporting using RAP in 2021, and also matched the 100 percent of companies reporting using RAP in the 2013 and 2014 construction season surveys.



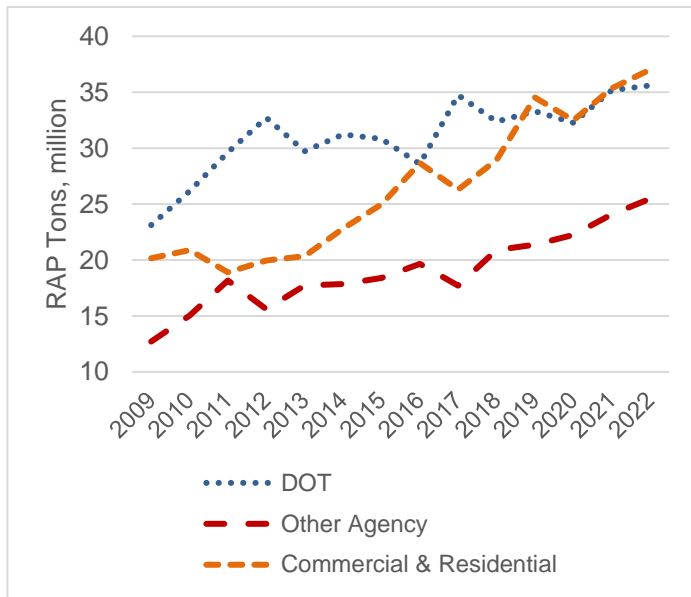
RAP	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Accepted	67.2	73.5	79.1	71.3	76.1	75.8	78.0	81.8	79.9	101.1	97.0	96.3	101.3	112.6
Landfilled	0.1	0.0	0.3	0.2	0.1	0.2	1.0	0.1	0.0	0.0	0.1	0.2	0.1	0.2
Used in Other	0.7	0.8	0.7	0.2	1.5	0.6	1.6	0.4	0.2	2.0	1.4	0.3	0.2	0.8
Used in 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	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	5.8
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	98.1

**Figure 3: Comparison of Tons of RAP Accepted and Tons of RAP Used or Landfilled (Million Tons), 2009–2022**

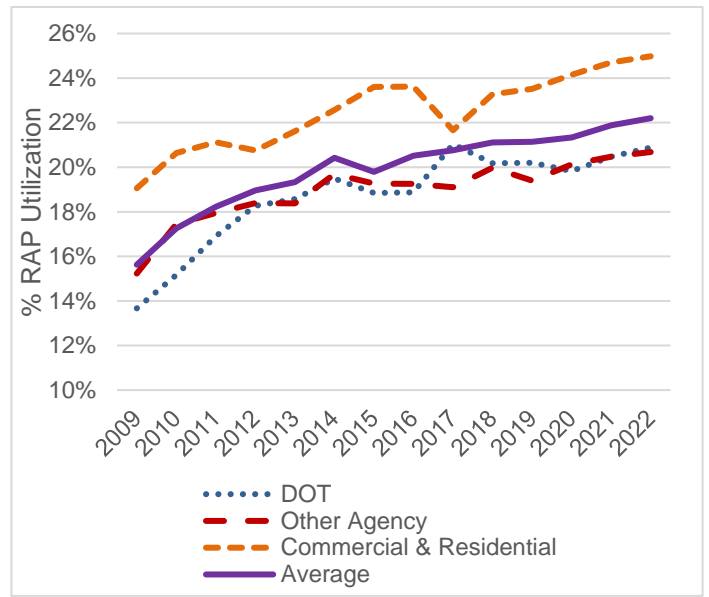
Placement of RAP in construction and demolition landfills is rare. Since the beginning of the survey in 2009, the average amount of RAP landfilled is less than 171,000 tons per year. In 2022, 226,063 tons, about 0.2 percent, of RAP was landfilled. The amount of RAP accepted during the 2022 construction season saved about 68.2 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.

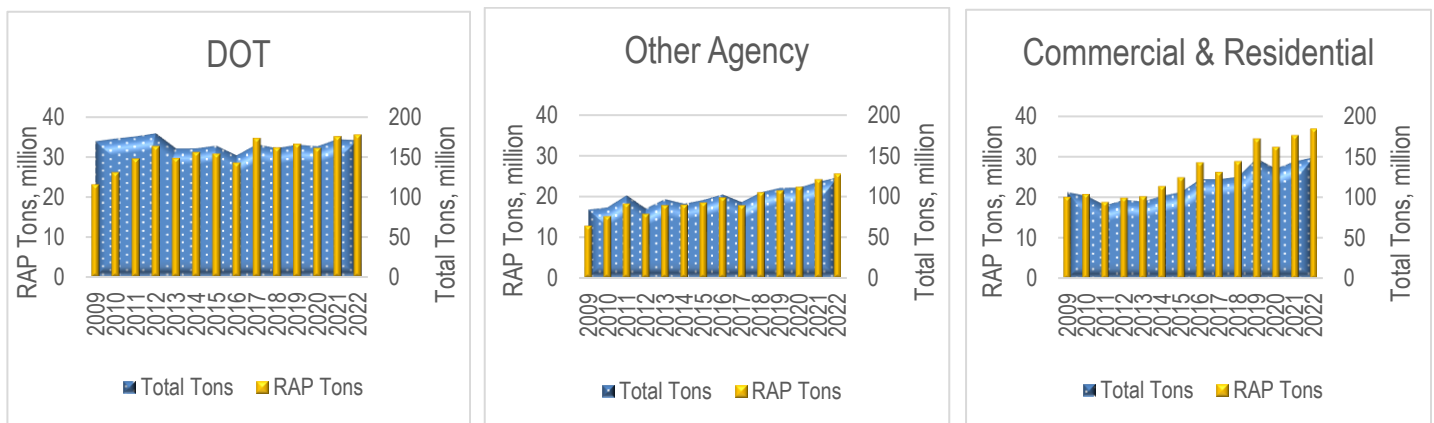


**Figure 4: RAP Use by Sector (Million Tons)**



**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 2022, the average percent RAP used by all sectors increased to a new high of 22.2 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 2022 increased slightly, remaining steady with the utilization percentages from 2021 to 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 2022 construction season, the tons of RAP used increased in all sectors. The changes in RAP tonnage were in line with changes in mix tonnages for each sector, and all the sectors had slight increases in their percent utilization, which resulted in the national average percentage of RAP used increasing from 21.9 percent in 2021 to 22.2 percent 2022 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 2022. 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, reaching 32 states in 2021, and the 31 states in 2022. 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, returning to 5 states in 2021, and then 6 states in 2022.

**Table 5: Average Estimated Percentage of RAP Used in Each State, 2018–2022**

State	Average RAP Percent					State	Average RAP Percent				
	2018	2019	2020	2021	2022		2018	2019	2020	2021	2022
Alabama	26%	25%	24%	26%	25%	Montana	*	*	*	*	*
Alaska	*	*	*	*	*	Nebraska	26%	*	20%	*	*
American Samoa	*	*	NCR	NCR	NCR	Nevada	*	*	17%	19%	*
Arizona	12%	9%	7%	4%	*	New Hampshire	18%	*	17%	22%	*
Arkansas	12%	13%	14%	11%	15%	New Jersey	18%	20%	17%	20%	21%
California	16%	16%	15%	17%	17%	New Mexico	19%	*	*	*	*
Colorado	20%	20%	19%	22%	19%	New York	17%	17%	18%	14%	20%
Connecticut	15%	21%	*	*	*	North Carolina	26%	24%	31%	31%	24%
Delaware	*	NCR	*	*	*	North Dakota	*	*	*	*	*
Dist. of Columbia	*	*	*	*	*	No. Mariana Isl.	NCR	NCR	NCR	NCR	NCR
Florida	27%	31%	34%	32%	34%	Ohio	28%	32%	28%	27%	28%
Georgia	25%	*	28%	31%	30%	Oklahoma	17%	19%	19%	19%	17%
Guam	NCR	NCR	NCR	NCR	NCR	Oregon	27%	26%	27%	29%	26%
Hawaii	23%	19%	*	18%	*	Pennsylvania	16%	13%	20%	21%	19%
Idaho	27%	24%	26%	26%	33%	Puerto Rico	NCR	NCR	NCR	NCR	NCR
Illinois	28%	23%	26%	28%	29%	Rhode Island	*	*	*	*	*
Indiana	24%	21%	24%	23%	24%	South Carolina	22%	22%	21%	27%	24%
Iowa	18%	19%	17%	17%	18%	South Dakota	NCR	NCR	*	*	*
Kansas	21%	*	26%	25%	26%	Tennessee	18%	24%	19%	20%	22%
Kentucky	16%	16%	18%	17%	18%	Texas	17%	16%	19%	18%	20%
Louisiana	22%	22%	17%	21%	*	U.S. Virgin Islands	*	NCR	NCR	NCR	NCR
Maine	*	*	17%	18%	18%	Utah	27%	28%	26%	29%	23%
Maryland	26%	30%	28%	28%	29%	Vermont	*	*	*	*	*
Massachusetts	16%	16%	15%	18%	17%	Virginia	28%	28%	31%	31%	29%
Michigan	28%	29%	26%	27%	28%	Washington	24%	23%	24%	23%	23%
Minnesota	25%	24%	24%	22%	23%	West Virginia	20%	18%	17%	16%	14%
Mississippi	20%	23%	20%	20%	20%	Wisconsin	17%	21%	21%	21%	21%
Missouri	21%	27%	23%	27%	26%	Wyoming	*	*	*	*	*
NCR No Company Responding	* < 3 Companies Reporting		0–9%		10–14%	15–19%	20–29%		≥ 30%		



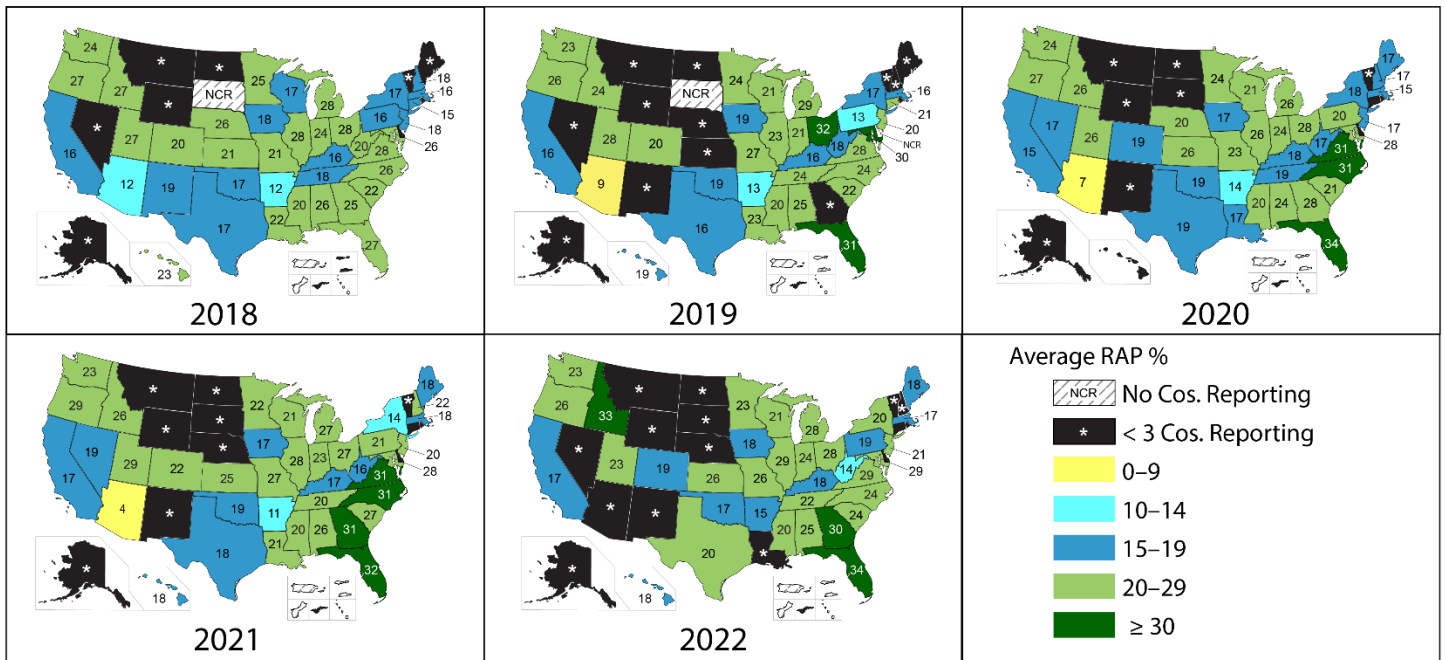


Figure 7: Estimated Average Percentage of RAP Used in Each State, 2018–2022

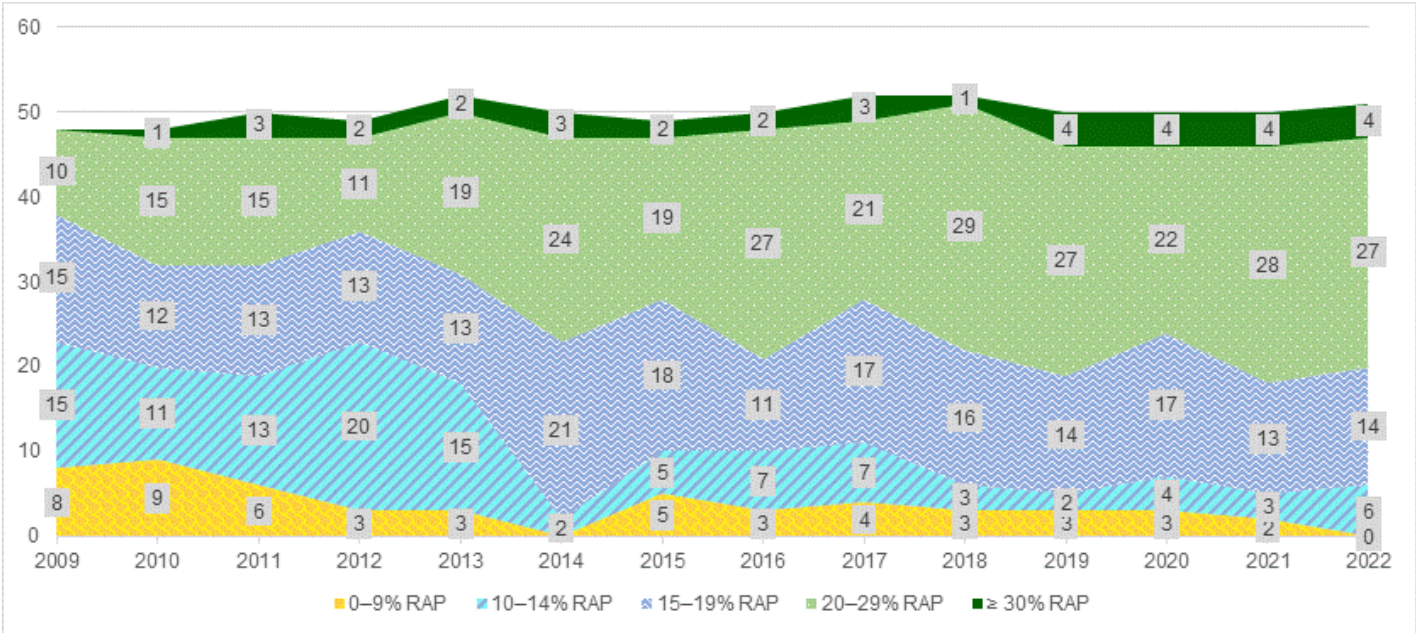


Figure 8: Number of States at Different Average Percentage of RAP Used in HMA/WMA Mixtures, 2009–2022



## RAP Stockpiles

During the 2022 construction season, an estimated 112.6 million tons of RAP was accepted by asphalt mixture producers, and 104.8 million tons of RAP was used across all purposes during the year. In 2022, as in 2021, 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 2022, the estimated amount of RAP stockpiled nationwide increased to 154.6 million tons, a 12 percent increase from the 137.5 million tons of RAP stockpiled at the end of the 2021 construction season. The increase in stockpiled inventory grew faster than the difference in the amount of RAP used and accepted, which can occur due to variance in companies responding to the 2022 construction season survey versus the prior-year survey. For 2022, 97.4 percent of producers reported having stockpiled RAP, down from 97.7 percent of producers in 2021. The reported RAP stockpiled represents about 1.4 years of inventory at 2022 utilization levels. Table 6 shows the reported and estimated amount of RAP stockpiled in each state at the end of the 2022 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)	
	2021	2022	2021	2022		2021	2022	2021	2022
Alabama	1.26	1.57	1.62	2.88	Montana	*	*	*	*
Alaska	*	*	*	*	Nebraska	*	*	*	*
American Samoa	NCR	NCR	NCR	NCR	Nevada	0.29	*	0.65	*
Arizona	1.02	*	2.13	*	New Hampshire	0.29	*	0.30	*
Arkansas	0.32	0.36	0.70	0.75	New Jersey	9.59	10.24	26.89	27.27
California	0.99	0.65	2.92	1.86	New Mexico	*	*	*	*
Colorado	0.31	0.80	0.77	3.16	New York	0.65	0.56	2.65	1.87
Connecticut	*	*	*	*	North Carolina	4.39	4.85	6.35	5.07
Delaware	*	*	*	*	North Dakota	*	*	*	*
District of Columbia	*	*	*	*	No. Mariana Isl.	NCR	NCR	NCR	NCR
Florida	2.04	1.81	5.21	4.29	Ohio	3.09	4.35	3.46	7.67
Georgia	2.25	3.06	5.03	6.27	Oklahoma	1.21	0.85	1.21	1.28
Guam	NCR	NCR	NCR	NCR	Oregon	0.69	1.24	2.05	2.33
Hawaii	0.13	*	0.24	*	Pennsylvania	0.88	1.78	3.09	5.29
Idaho	0.59	0.63	1.39	1.03	Puerto Rico	NCR	NCR	NCR	NCR
Illinois	1.16	1.66	2.39	3.63	Rhode Island	*	*	*	*
Indiana	3.71	1.22	5.05	2.51	South Carolina	1.68	0.77	1.68	1.15
Iowa	0.65	0.30	1.83	0.97	South Dakota	*	*	*	*
Kansas	0.80	0.72	1.31	1.15	Tennessee	1.67	1.97	2.59	5.19
Kentucky	0.96	2.86	1.98	3.24	Texas	2.14	1.51	11.00	9.56
Louisiana	0.21	*	1.02	*	U.S. Virgin Islands	NCR	NCR	NCR	NCR
Maine	0.29	0.20	0.29	0.22	Utah	1.08	1.01	1.45	2.20
Maryland	2.27	1.29	4.49	3.00	Vermont	*	*	*	*
Massachusetts	0.92	3.60	3.67	7.18	Virginia	2.37	2.44	4.15	4.33
Michigan	2.28	2.32	3.77	2.96	Washington	0.73	0.44	0.98	0.84
Minnesota	1.88	1.90	2.00	1.99	West Virginia	0.36	0.44	0.65	0.83
Mississippi	0.46	0.50	0.74	0.93	Wisconsin	2.70	2.18	4.00	2.65
Missouri	0.46	0.60	1.47	1.44	Wyoming	*	*	*	*
<b>Total†</b>						<b>59.82</b>	<b>63.12</b>	<b>137.45</b>	<b>154.55</b>

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 2022 data, with an example being Kentucky, which reports 58 percent of RAP being fractionated and averaging under 18 percent RAP in mixtures, while Florida reported only 3 percent of RAP being fractionated but averaged over 33 percent RAP in mixtures.

**Table 7: Reported Percentage of RAP Fractionated, in Each State, 2021–2022**

State	% Fractionated		State	% Fractionated		State	% Fractionated	
	2021	2022		2021	2022		2021	2022
Alabama	35%	45%	Kentucky	34%	58%	Ohio	20%	19%
Alaska	*	*	Louisiana	50%	*	Oklahoma	44%	43%
American Samoa	NCR	NCR	Maine	0%	33%	Oregon	1%	0%
Arizona	0%	*	Maryland	7%	25%	Pennsylvania	28%	3%
Arkansas	16%	17%	Massachusetts	0%	0%	Puerto Rico	NCR	NCR
California	19%	26%	Michigan	28%	26%	Rhode Island	*	8
Colorado	34%	16%	Minnesota	11%	7%	South Carolina	63%	56%
Connecticut	*	*	Mississippi	5%	5%	South Dakota	*	*
Delaware	*	*	Missouri	24%	35%	Tennessee	63%	63%
Dist. of Columbia	*	*	Montana	*	*	Texas	60%	34%
Florida	4%	3%	Nebraska	*	*	U.S. Virgin Isl.	NCR	NCR
Georgia	33%	0%	Nevada	0%	*	Utah	15%	6%
Guam	NCR	NCR	New Hampshire	0%	*	Vermont	*	*
Hawaii	33%	*	New Jersey	33%	33%	Virginia	29%	43%
Idaho	20%	0%	New Mexico	*	*	Washington	27%	22%
Illinois	61%	61%	New York	0%	14%	West Virginia	0%	0%
Indiana	51%	35%	North Carolina	27%	26%	Wisconsin	5%	6%
Iowa	0%	7%	North Dakota	*	*	Wyoming	*	*
Kansas	32%	30%	No. Mariana Isl.	NCR	NCR			
<b>Average, Where Used†</b>							25%	20%

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 31 states using 20 percent or more RAP, 27 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, 2022**

State	Softer Binder	Recyc. Agent	State	Softer Binder	Recyc. Agent	State	Softer Binder	Recyc. Agent
Alabama	0%	0%	Kentucky	6%	1%	Ohio	38%	10%
Alaska	*	*	Louisiana	*	*	Oklahoma	16%	1%
American Samoa	NCR	NCR	Maine	0%	33%	Oregon	1%	0%
Arizona	*	*	Maryland	17%	12%	Pennsylvania	8%	5%
Arkansas	0%	0%	Massachusetts	0%	3%	Puerto Rico	NCR	NCR
California	15%	40%	Michigan	23%	0%	Rhode Island	*	*
Colorado	5%	0%	Minnesota	30%	2%	South Carolina	0%	0%
Connecticut	*	*	Mississippi	0%	0%	South Dakota	*	*
Delaware	*	*	Missouri	55%	14%	Tennessee	1%	16%
Dist. of Columbia	*	*	Montana	*	*	Texas	8%	1%
Florida	74%	16%	Nebraska	*	*	U.S. Virgin Isl.	NCR	NCR
Georgia	0%	0%	Nevada	*	*	Utah	35%	13%
Guam	NCR	NCR	New Hampshire	*	*	Vermont	*	*
Hawaii	*	*	New Jersey	3%	31%	Virginia	9%	5%
Idaho	58%	3%	New Mexico	*	*	Washington	32%	3%
Illinois	44%	4%	New York	0%	5%	West Virginia	0%	0%
Indiana	1%	0%	North Carolina	32%	0%	Wisconsin	21%	1%
Iowa	0%	0%	North Dakota	*	*	Wyoming	*	*
Kansas	90%	2%	No. Mariana Isl.	NCR	NCR			
<b>Average, When Used<sup>†</sup></b>							18%	7%

NCR No Companies Responding for the State to the Survey

\* Fewer than 3 Companies Reporting

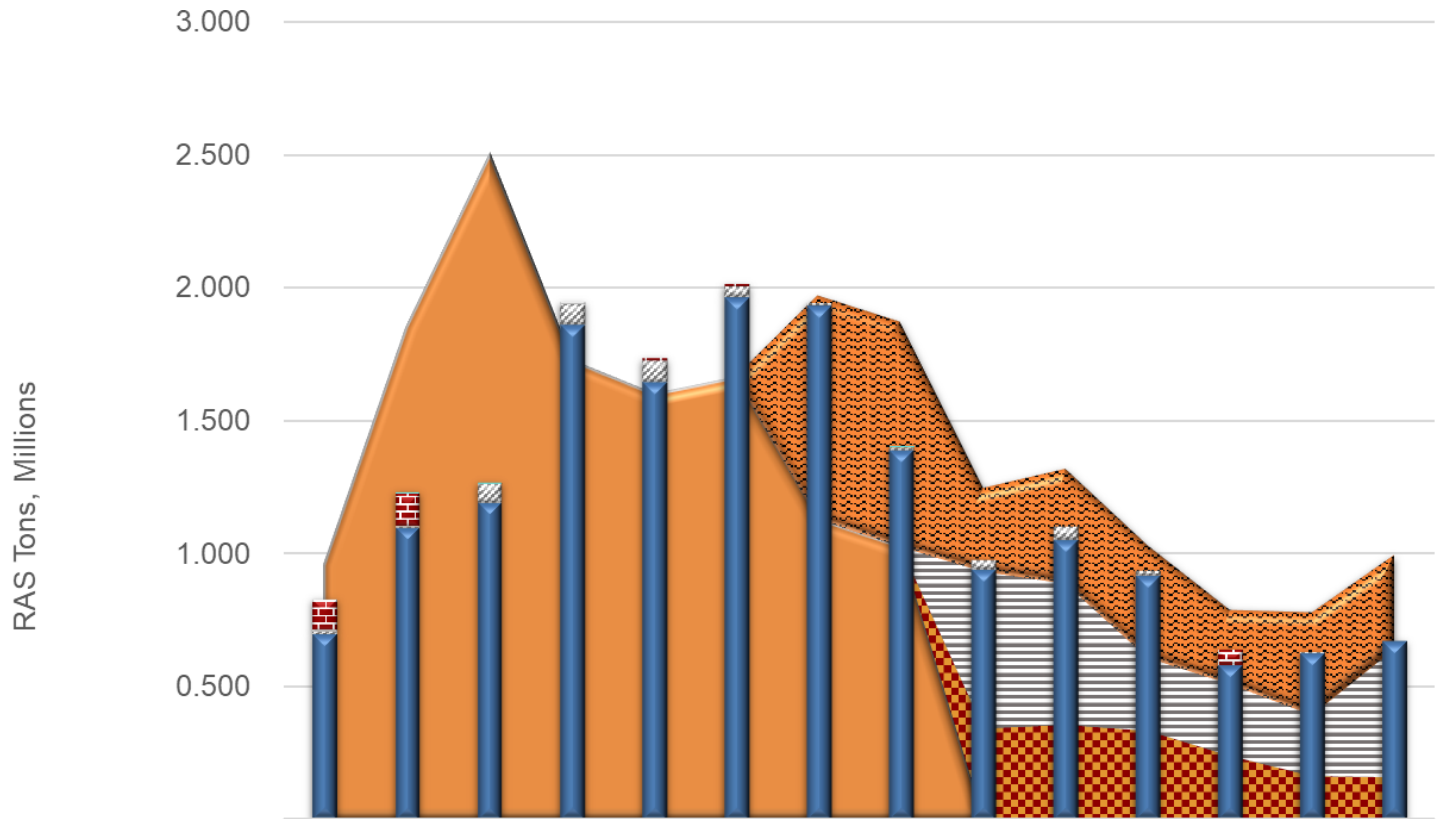
<sup>†</sup> Includes Values from States with Fewer than 3 Companies Reporting

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 18 percent during the 2022 construction season, which is down from 22 percent in the 2021 survey. The percentage of RAP mixtures incorporating recycling agents has fluctuated year to year with 7 percent in 2022, 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 2021 and 2022 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 2022 construction season surveys.

During the 2022 construction season, the total estimated amount of unprocessed and processed shingles received by producers was 997,000 tons, which is more than combined amount of RAS used in asphalt mixtures (673,000 tons) for the year. This is a 28 percent increase from the 780,000 total tons of RAS from all sources accepted during the 2021 construction season. The use of 673,000 tons of RAS in asphalt pavement mixtures during 2022 is a 7 percent increase from the 630,000 tons used in 2021.



RAS	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Processed Shingles Accepted	-	-	-	-	-	-	0.842	0.846	0.311	0.430	0.423	0.278	0.385	0.356
PCAS	-	-	-	-	-	-	-	-	0.591	0.534	0.277	0.277	0.230	0.483
MWAS	-	-	-	-	-	-	-	-	0.344	0.356	0.334	0.237	0.165	0.158
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	0.673

**Figure 9: Comparison of Tons of RAS Accepted and Tons of RAS Used or Landfilled (Million Tons), 2009–2022. 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 4 percent decrease in the acceptance of MWAS and a significant (110 percent) increase in the acceptance of PCAS in 2022 compared to 2021, with an 8 percent decrease in the acceptance of processed shingles, leading to a significant (28 percent) increase in the total amount of RAS accepted during the 2022 construction season. The total estimated amount of unprocessed shingles accepted by producers increased 62 percent from 395,000 tons in 2021 to 641,000 tons in 2022. Acceptance of processed shingles decreased 8 percent during the same time period, from 385,000 tons in 2021 to 356,000 tons in 2022.

No RAS accepted by producers was reported as landfilled during the 2022 construction season. By accepting 641,00 tons of unprocessed RAS from both PCAS and MWAS sources, asphalt mixture producers saved about 390,000 cubic yards of landfill space.

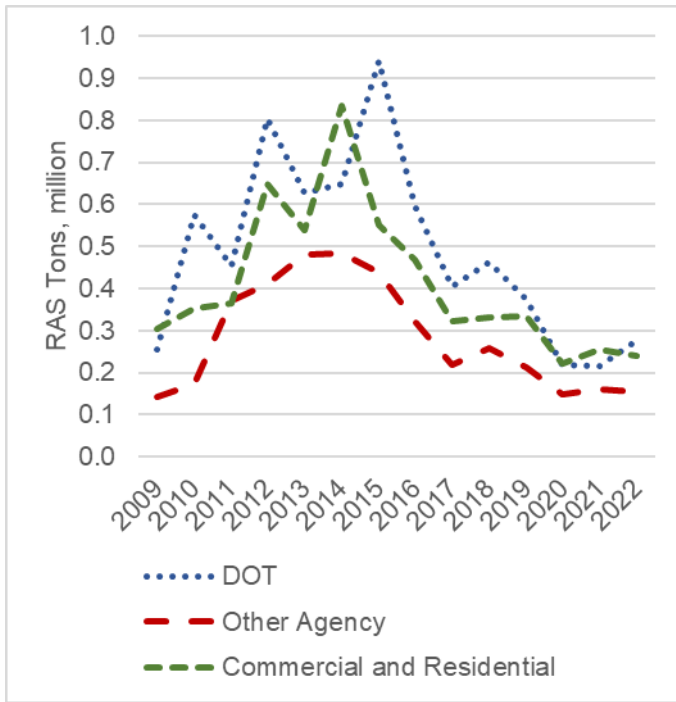
According to the United States Environmental Protection Agency (U.S. EPA, 2020), about 15.1 million tons of waste shingles are generated annually. Therefore, asphalt mixture producers in 2022 diverted about 4.2 percent of the total available supply of waste shingles from landfills.

The number of companies using RAS decreased from 65 in 2021 to 50 during the 2022 construction season. The percentage of producers reporting use of RAS decreased from 25 percent of respondents in 2021 to 21 percent in 2022.

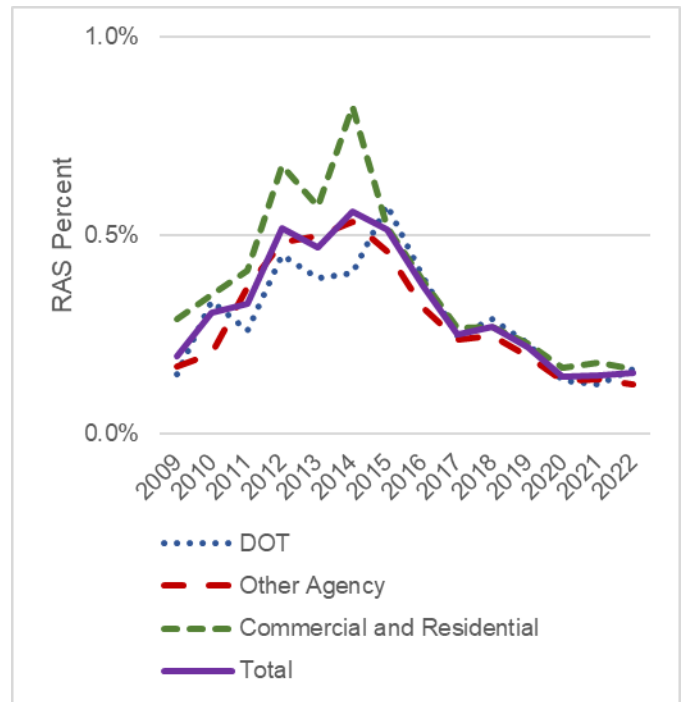
## **RAS Use by Sector**

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 Other Agency and Commercial and Residential sectors and an increase in the tons of RAS used by the DOT sector from the 2021 to 2022 construction season. The DOT sector also saw an increase in the percentage of RAS use from 2021 to 2022, while the Other Agency and Commercial and Residential sectors percentage decreased from 2021 to 2022.

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 2022 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 and 2022 construction season.

In 2022, 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, 27 DOTs reportedly allow RAS in some asphalt pavement mixtures, and five other DOTs allow it in all mixtures. RAS use is allowed in some Other Agency sector mixtures in 35 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, 2022**

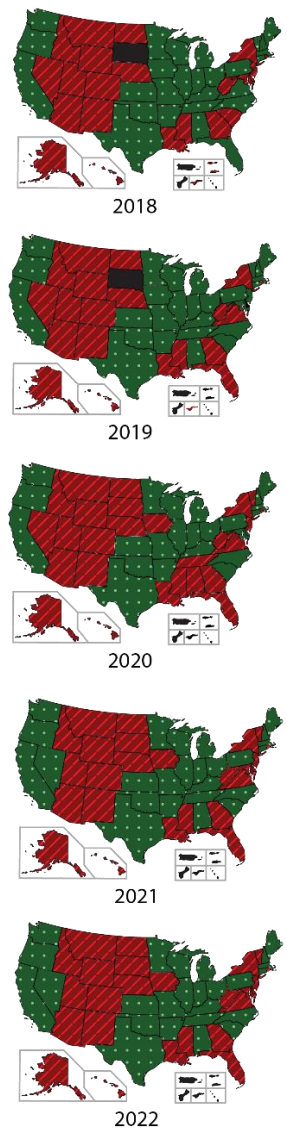
State	RAS Allowed In?			State	RAS Allowed In?		
	DOT Mixtures	Other Agency Mixtures	Commercial & Residential Mixtures		DOT Mixtures	Other Agency Mixtures	Commercial & Residential Mixtures
Alabama	Some	Some	Some	Montana	Some	None	Some
Alaska	None	None	None	Nebraska	Some	Some	Some
American Samoa	NCR	NCR	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	None	None	Some	New York	Some	Some	Some
Connecticut	Some	Some	Some	North Carolina	All	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	None	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	All	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	Some	Some	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, 2012–2022**

State	RAS Used?											
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
Alabama	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	No	Yes	Yes	
Alaska	No	No	No	No	No	No	No	No	No	No	No	
American Samoa	NCR	NCR	NCR	NCR	NCR	No	No	No	NCR	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	No	Yes	Yes	Yes	Yes	No	No	No	No	No	
Connecticut	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Delaware	Yes	Yes	Yes	Yes	Yes	No	No	NCR	Yes	No	No	
District of Columbia	NCR	No	NCR	NCR	NCR	No	No	No	No	No	No	
Florida	No	Yes	Yes	Yes	No	No	Yes	No	No	No	No	
Georgia	Yes	Yes	No	No	Yes	No	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	No	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	Yes	No	No	Yes	No	No	No	No	No	No	
Maine	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
Maryland	Yes	Yes	Yes	Yes	No	Yes	No	Yes	Yes	Yes	Yes	
Massachusetts	No	Yes	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	No	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	Yes	Yes	No	No	Yes	No	No	No	No	No	No	
Nevada	No	No	No	No	Yes	Yes	No	No	No	No	No	
New Hampshire	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
New Jersey	No	Yes	No	No	No	No	No	Yes	No	No	No	
New Mexico	NCR	No	No	NCR	Yes	Yes	No	No	No	No	No	
New York	Yes	Yes	Yes	Yes	No	Yes	No	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	NCR	No	NCR	NCR	NCR	NCR	NCR	NCR	NCR	
Rhode Island	No	No	No	No	No	No	No	No	No	No	No	
South Carolina	No	Yes	Yes	No	Yes	No	No	Yes	Yes	Yes	Yes	
South Dakota	Yes	Yes	Yes	NCR	Yes	No	NCR	NCR	No	No	No	
Tennessee	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	
Texas	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	
U.S. Virgin Islands	NCR	NCR	NCR	NCR	NCR	NCR	No	NCR	NCR	NCR	NCR	
Utah	No	No	No	No	No	No	No	No	No	No	No	
Vermont	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	No	No	No	
Virginia	Yes	Yes	Yes	Yes	Yes	No	Yes	No	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	Yes	No	No	Yes	No	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, 2018–2022**

## RAS Use in Each State

Table 10 shows states where asphalt pavement mixture producers reported using RAS in 2012 through 2022, and Figure 12 shows states where producers reported using RAS from 2018 through 2022. 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, 24 in 2020, and 25 in 2021. During the 2022 construction season, asphalt mixture producers in 25 states report RAS use. Iowa and Virginia producers continue to report no RAS use, while still reporting that RAS is allowed in some mixtures for all sectors.

## RAS Stockpiles

In 2022, 98 percent of the 50 producers using RAS reported having inventories of stockpiled RAS, compared to 97 percent of the 65 producers using RAS in 2021. Some 1.43 million tons of RAS was reported as stockpiled at year-end 2022, a (26.3 percent) increase from the 1.132 million tons of RAS in stockpiles at the end of 2021. The reported RAS stockpiled represents about 2.1 years of inventory at 2022 utilization levels.

**Table 11: Reported Tons of RAS Stockpiled, 2021–2022**

State	Reported Tons Stockpiled (Thousands)		Estimated Tons Stockpiled (Thousands)		State	Reported Tons Stockpiled (Thousands)		Estimated Tons Stockpiled (Thousands)	
	2021	2022	2021	2022		2021	2022	2021	2022
Alabama	5.0	6.5	6.4	11.9	Montana	*	*	*	*
Alaska	*	*	*	*	Nebraska	*	*	*	*
American Samoa	NCR	NCR	NCR	NCR	Nevada	0.0	*	0.0	*
Arizona	0.0	*	0.0	*	New Hampshire	0.0	*	0.0	*
Arkansas	17.2	6.0	37.5	12.6	New Jersey	0.0	0.0	0.0	0.0
California	0.0	0.9	0.0	2.4	New Mexico	*	*	*	*
Colorado	0.0	0.0	0.0	0.0	New York	0.0	0.0	0.0	0.0
Connecticut	*	*	*	*	North Carolina	173.5	190.6	251.0	199.3
Delaware	*	*	*	*	North Dakota	*	*	*	*
District of Columbia	*	*	*	*	No. Mariana Isl.	NCR	NCR	NCR	NCR
Florida	0.0	5.0	0.0	11.8	Ohio	24.0	70.0	26.9	123.5
Georgia	14.5	0.0	32.5	0.0	Oklahoma	22.2	0.3	22.2	0.4
Guam	NCR	NCR	NCR	NCR	Oregon	9.1	34.1	27.2	64.2
Hawaii	0.0	*	0.0	*	Pennsylvania	5.0	70.2	17.6	208.2
Idaho	0.0	0.0	0.0	0.0	Puerto Rico	NCR	NCR	NCR	NCR
Illinois	3.5	2.7	7.2	5.9	Rhode Island	*	*	*	*
Indiana	2.3	2.6	3.1	5.3	South Carolina	24.5	22.0	24.5	32.9
Iowa	5.0	4.0	14.1	12.9	South Dakota	*	*	*	*
Kansas	7.4	16.5	12.2	26.6	Tennessee	2.6	5.6	4.0	14.7
Kentucky	50.4	0.0	104.3	0.0	Texas	39.9	4.1	205.0	26.0
Louisiana	0.0	*	0.0	*	U.S. Virgin Isl.	NCR	NCR	NCR	NCR
Maine	0.3	0.1	0.3	0.1	Utah	0.0	0.0	0.0	0.0
Maryland	5.6	20.2	11.1	46.9	Vermont	*	*	*	*
Massachusetts	12.5	11.2	49.7	22.4	Virginia	5.0	4.0	8.8	7.1
Michigan	2.0	1.5	3.3	1.9	Washington	6.5	12.1	8.7	23.2
Minnesota	18.5	6.0	19.7	6.3	West Virginia	0.0	0.0	0.0	0.0
Mississippi	0.0	0.0	0.0	0.0	Wisconsin	46.5	98.7	68.9	119.9
Missouri	7.5	30.0	24.0	71.9	Wyoming	*	*	*	*
					<b>Total†</b>	<b>518.6</b>	<b>620.9</b>	<b>1132.2</b>	<b>1430.0</b>

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 2021 and 2022 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, 2022**

State	Softer Binder	Recyc. Agent	State	Softer Binder	Recyc. Agent	State	Softer Binder	Recyc. Agent
Alabama	0%	0%	Kentucky	0%	0%	Ohio	100%	0%
Alaska	*	*	Louisiana	*	*	Oklahoma	100%	100%
American Samoa	NCR	NCR	Maine	0%	0%	Oregon	0%	10%
Arizona	*	*	Maryland	50%	0%	Pennsylvania	0%	0%
Arkansas	0%	0%	Massachusetts	0%	15%	Puerto Rico	NCR	NCR
California	0%	0%	Michigan	25%	0%	Rhode Island	*	*
Colorado	0%	0%	Minnesota	10%	0%	South Carolina	0%	0%
Connecticut	*	*	Mississippi	0%	0%	South Dakota	*	*
Delaware	*	*	Missouri	68%	34%	Tennessee	0%	50%
Dist. of Columbia	*	*	Montana	*	*	Texas	36%	0%
Florida	100%	0%	Nebraska	*	*	U.S. Virgin Isl.	NCR	NCR
Georgia	0%	0%	Nevada	*	*	Utah	0%	0%
Guam	NCR	NCR	New Hampshire	*	*	Vermont	*	*
Hawaii	*	*	New Jersey	0%	0%	Virginia	0%	0%
Idaho	0%	0%	New Mexico	*	*	Washington	50%	0%
Illinois	43%	0%	New York	0%	0%	West Virginia	0%	0%
Indiana	34%	0%	North Carolina	80%	0%	Wisconsin	30%	3%
Iowa	0%	0%	North Dakota	*	*	Wyoming	*	*
Kansas	100%	0%	No. Mariana Isl.	NCR	NCR			
<b>Average, When Used<sup>†</sup></b>							20%	8%

NCR No Companies Responding for the State to the Survey

\* Fewer than 3 Companies Reporting

<sup>†</sup> 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 20 percent during the 2022 construction season, while the percentage of RAS mixtures incorporating recycling agents was at 8 percent. In 2021, producers reported a higher average percentage (29 percent) of RAS mixtures incorporating softer binders and a lower percentage (4 percent) of RAS mixtures incorporating recycling agents, as compared to the 2022 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 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.

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 2022 construction season. In total, the use of RAP and RAS saved more than \$4.7 billion during the 2022 construction season compared to the use of all virgin materials. This is \$1,183 million more than in 2021 due to increases in virgin material prices (Table 14) and increased total asphalt mixture tonnages in 2022.

**Table 13: Material Savings, 2021–2022**

Material	Material Quantity, Million Tons		% Agg.	% AC	Aggregate Cost Savings, \$ Billion		Asphalt Binder Cost Savings, \$ Billion		Total Cost Savings, \$ Billion	
	2021	2022			2021	2022	2021	2022	2021	2022
RAP	94.6	98.1	95	5	\$1.035	\$1.178	\$2.457	\$3.466	\$3.492	\$4.644
RAS	0.630	0.673	50*	20	\$0.004	\$0.004	\$0.065	\$0.095	\$0.069	\$0.099
Total					\$1.038	\$1.182	\$2.522	\$3.561	\$3.561	\$4.743

\* Includes granules and mineral filler

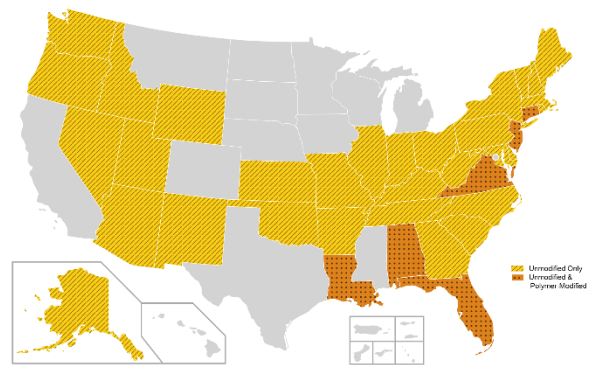
The estimated savings shown in Table 13 were based on the cost factors shown in Table 14. Asphalt binder prices were estimated based upon an average of publicly available 2022 asphalt price indexes for 37 states (see Figure 13). The average price of unmodified asphalts from these states for 2022 was about \$679.26 per ton, up from the 2021 average price of \$490.65. Six of the states (Alabama, Connecticut, Florida, Louisiana, New Jersey and Virginia) also provide price

indexes for modified asphalts. The average modified asphalt prices from these states for 2022 was \$794.99 per ton, up from \$614.01 in 2021. Assuming 10 percent of asphalt mixtures use modified asphalt binders, the 2022 average price of asphalt binders used in asphalt mixtures was \$706.61 per ton, up 36.0 percent from 2021.

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 \$12.91 per ton and Sand and Gravel (Construction) increased to \$10.21 per ton for 2022 (USGS, 2024). 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 \$12.64 per ton for the 2022 construction season, up 9.8 percent from 2021.

**Table 14: Material Cost Factors, 2019–2022**

Material		% of Market	Cost/Ton			
			2019	2020	2021	2022
Asphalt	Unmodified	90	\$500.38	\$442.35	\$490.65	679.26
	Modified	10	\$646.63	\$572.89	\$614.01	794.99
	Weighted Average		\$532.46	\$473.72	\$519.45	706.61
Aggregate	Crushed Stone	90	\$11.12	\$11.06	\$11.79	\$12.91
	Sand and Gravel	10	\$8.01	\$8.70	\$8.98	\$10.21
	Weighted Average		\$10.81	\$10.82	\$11.51	\$12.64



**Figure 13: States with Publicly Available Asphalt Price Indexes, 2022**

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 2022 national average for MSW landfill gate fees of \$58.47 per ton, not sending more than 113 million tons of RAP and RAS to landfills (nearly 69 million cubic yards of material) saved more than \$5.7 billion dollars in gate fees, up from \$5.1 billion in 2021, due in part to an 8 percent increase in MSW gate fees from 2021 to 2022 (EREF, 2023).

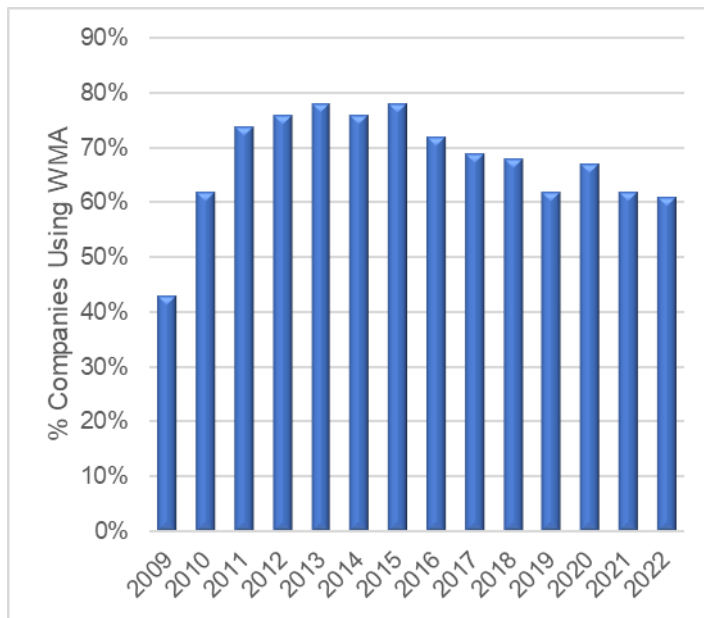
## Warm-Mix Asphalt Technology

Table 4 includes the national summary of WMA technology usage data from the 2021 and 2022 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.

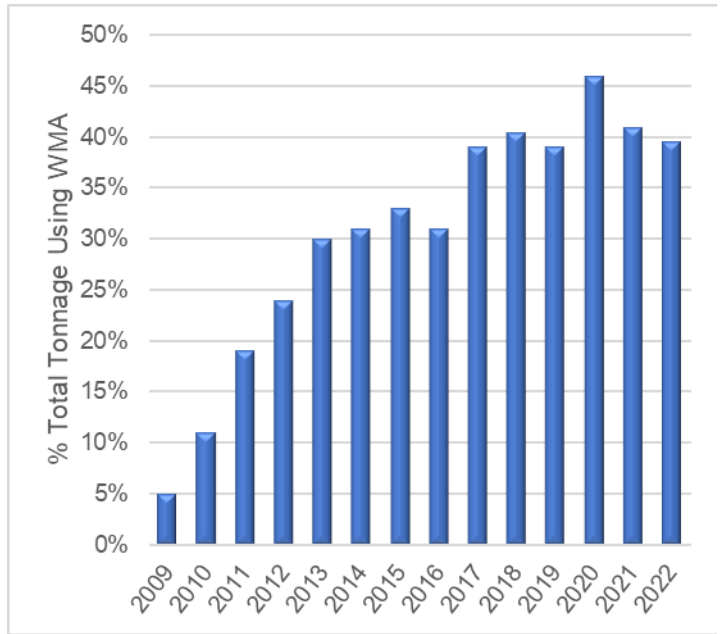
Prior to the 2018 construction season, producers were asked to report primarily the use of WMA technologies to reduce production temperatures by at least 10°F from typical mixture production temperatures. However, because of potential compaction, antistripping, and workability benefits, the use of WMA technologies at HMA temperatures is common. To better understand the use of WMA technologies at different temperatures, the 2018, 2019, 2020, 2021, and 2022 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, dropping to 62 percent in 2021, and then declining slightly to 61% for the 2022 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 2022 construction season had a 1 percent decrease in the production of asphalt with WMA technologies to 175.0 million tons, 39.6 percent of total asphalt pavement tonnage. A total of 144 companies, 61 percent of respondents, reported using WMA technologies during the 2022 construction season.



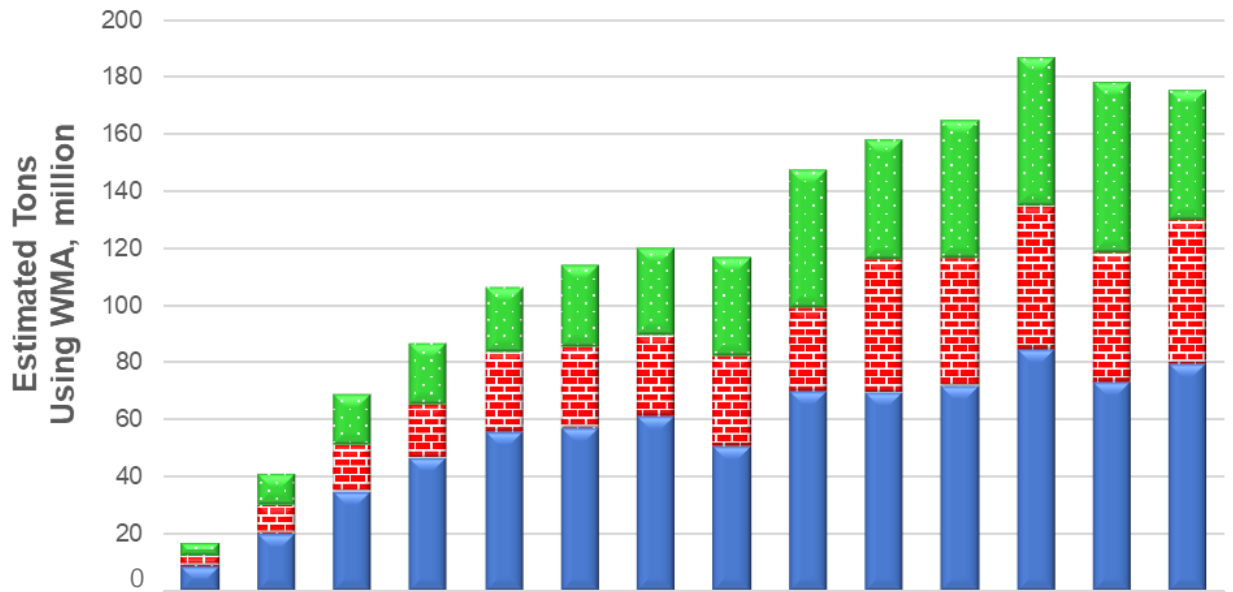
**Figure 14: Percent of Companies Using WMA Technologies**



**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 through 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. The 2022 construction season saw an increase for the DOT and Other Agency Sectors, with a decline in tonnage for the Commercial & Residential sector. All in all, during the 2022 construction season, 46.6 percent of all DOT sector tonnage, 40.7 percent of Other Agency sector tonnage, and 30.7 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	2022
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	45.5
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	50.1
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	79.4

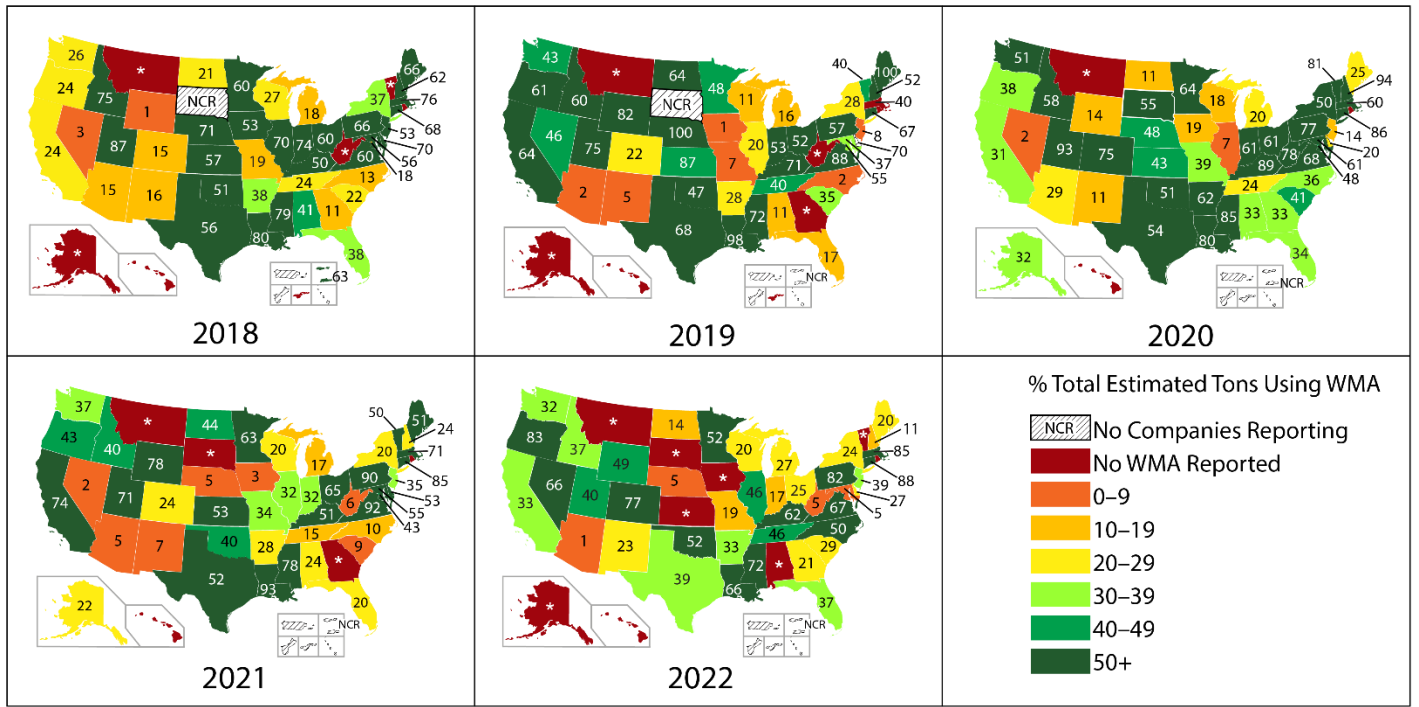
**Figure 16: Estimated Tons (Millions) Produced With WMA Technologies by Sector, 2009–2022**

### WMA Technology Use in Each State

In Figure 17, the estimated percentage of total tons produced as WMA in each state is depicted. The national trend from 2009 through 2020 reveals increased tons of asphalt mixture produced with WMA technologies, with a slight decrease in tonnage observed in 2021 and 2022.; 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 2021 to 2022, 16 states saw an increase of 10 percentage points or more in WMA production, while 16 states had a decrease of 10 percentage points or more. Six states — Colorado, Nevada, North Carolina, Oregon, Tennessee, and Wisconsin — had an increase of 30 percentage points or more in mixture production with WMA technologies. Seven states —California, Maine, Maryland, North Dakota, Ohio, Utah, and Vermont — 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 15 states during 2022, five of these states — Colorado, Connecticut, Massachusetts, Oregon, and Pennsylvania — reported WMA as 75 percent or more of total production in 2022. Alabama, Alaska, Hawaii, Iowa, Montana, Nebraska, Rhode Island, South Dakota, and Vermont had no reported asphalt production with WMA technologies in 2022.



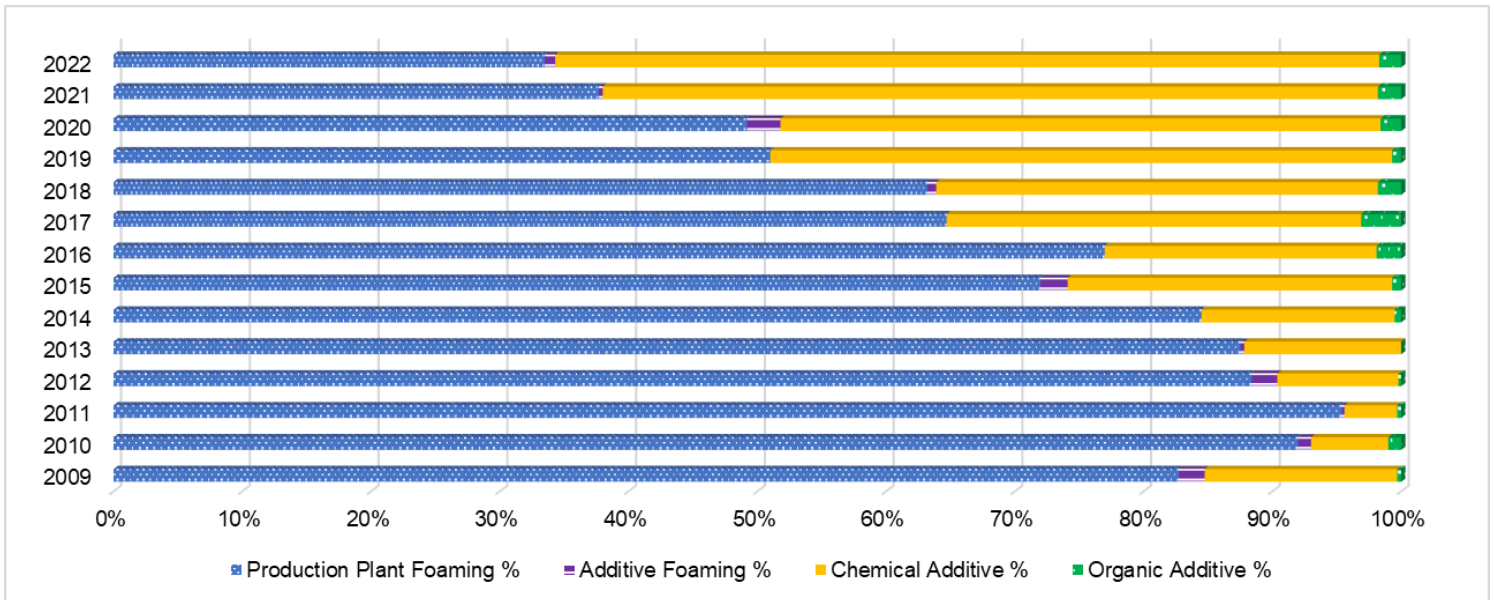
**Figure 17: Estimated Percent of Total Production Using WMA Technologies in Each State, 2018–2022**

### WMA Technologies

As Table 15 and Figure 18 show, production plant foaming continued to fall from its previous spot as the most commonly used WMA production technology, being used for around 34 percent of the WMA produced in 2022. This is a decrease of about 11 percent from the 2021 season. The use of chemical additive technologies at 64.0 percent represents a 6 percent increase for the 2022 construction season compared to 2021. Organic additives represented 1.7 percent of the market. Additive foaming was 0.8 percent of the market during 2022. 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, 2009–2022**

WMA Technology	% Production														
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	
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%	33.5%	
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%	0.8%	
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%	64.0%	
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%	1.7%	



**Figure 18: WMA Technologies Used as Percent of WMA Production, 2009–2022**

*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 59.4 percent (103.9 million tons) of total tonnage produced using WMA technologies was produced with a temperature reduction of at least 10°F.

Of the respondents, 144 producers in 44 states, reported using WMA technologies. Of these, 83 producers reporting using WMA technologies at both reduced and HMA temperatures; 30 producers used WMA technologies only at reduced temperatures; and 31 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, 2022**

WMA Technology	% of Market		
	Reduced Temperatures	HMA Temperatures	At All Temperatures
Chemical Additive	62.4%	66.2%	64.0%
Plant Foaming	35.8%	30.2%	33.5%
Additive Foaming	1.0%	0.6%	0.8%
Organic Additive	0.8%	3.0%	1.7%
2022 Tons (Millions)	103.9	71.1	175.0

# 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 greenhouse gas (GHG) emission benefits is provided in Appendix C. GHG emissions are reported in million metric tonne (MMT) of CO<sub>2</sub>-equivalent (CO<sub>2</sub>e) 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

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 (71.5%) of mix produced at reduced temperature using WMA technology was in the range of 10° - 30°F. Smaller percentages (26.7% and 1.8%) 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 25.9°F (compared to 23.5°F in 2021). The weighted average temperature reduction achieved among all asphalt mix produced was 6.1°F (compared to 5.1°F in 2021).

**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	71.5%	26.7%	1.8%
Total (Tons, Millions)	74.3	27.8	1.8

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 0.18 MMT CO<sub>2</sub>e in 2022, equivalent to the annual emissions of 40,000 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 WMA technology produced at reduced temperature**

Weighted Average Temperature Reduction <sup>1</sup>	Mix Production Energy Reduction (trillion Btu)	Mix Production GHG Emissions Reduction (MMT CO <sub>2</sub> e)	Upstream GHG Emissions Burden <sup>2</sup> (MMT CO <sub>2</sub> e)	Net GHG Emissions Reduction (MMT CO <sub>2</sub> e)	Equivalent Number of Passenger Vehicles <sup>3</sup>
25.9°F	2.7	0.19	0.007	0.18	40,000

1. The weighted average temperature reduction for mix produced at reduced temperature using WMA technology is 25.9°F.
2. Based on the average carbon footprint of three available WMA additives. See Appendix C for details.
3. Assumes that each vehicle emits 4.6 tonne CO<sub>2</sub>e/yr (U.S. EPA, 2018).

The emissions reduction calculations for this year's report followed the same methodology used in the 2021 report. A detailed discussion of the assumptions and calculations for the energy and GHG emissions reductions is provided in Appendix C.

## GHG Emissions 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 2022 is estimated to be 2.7 MMT CO<sub>2e</sub>, equivalent to the annual emissions from approximately 596,000 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.

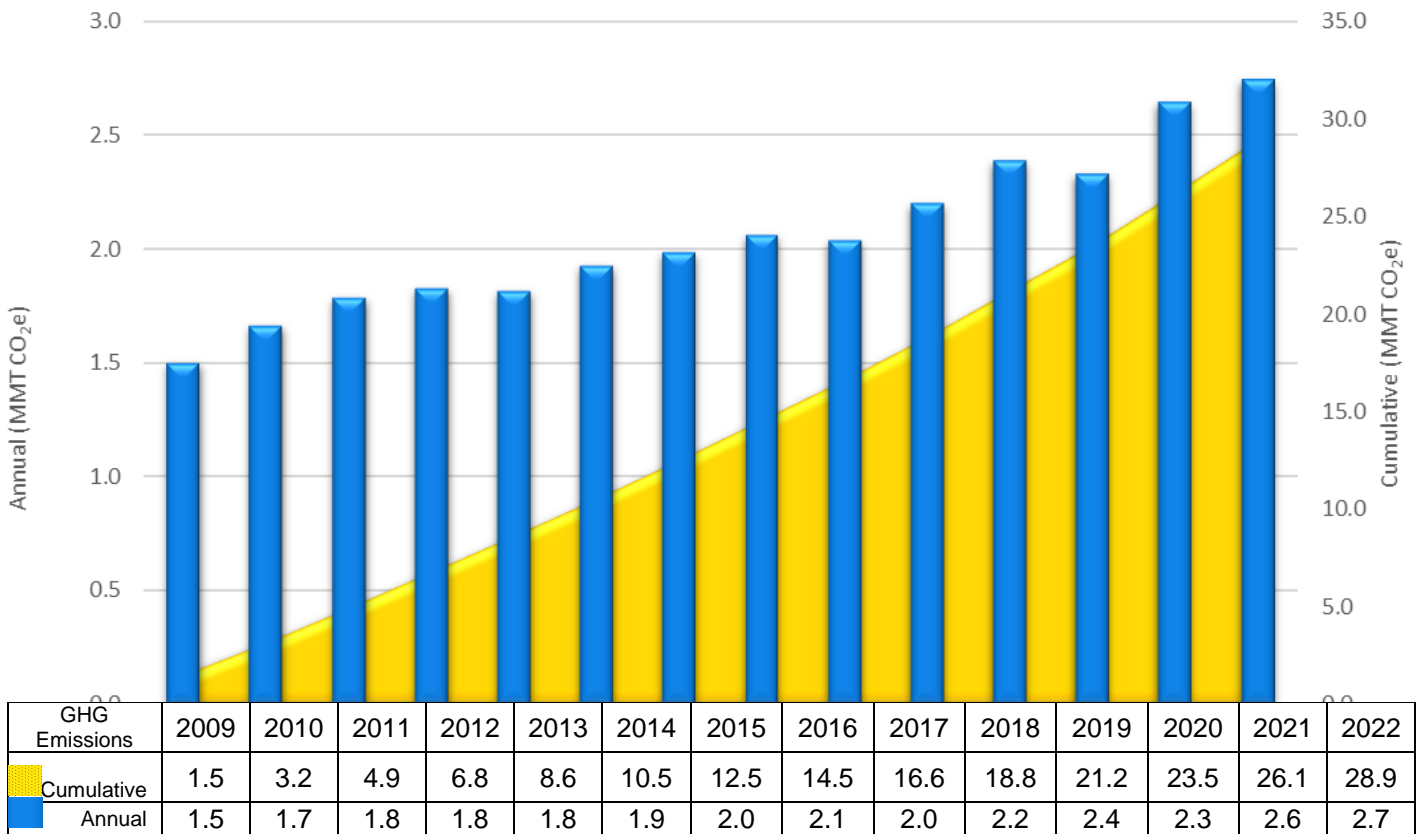
**Table 19: Summary of GHG Emission Reductions and Burdens from use of RAP in New Asphalt Mixtures in 2019 (MMT CO<sub>2e</sub>)**

Description	GHG Reduction (Burden)
<b>Avoided Emissions</b>	
Asphalt Binder Replacement	2.83
Aggregate Replacement	0.16
Transportation of Asphalt Binder and Aggregates	0.46
<b>Subtotal Avoided Emissions</b>	<b>3.5</b>
<b>Emission Burdens<sup>1</sup></b>	
RAP Processing	(0.12)
Transportation of RAP	(0.60)
<b>Subtotal Emission Burdens</b>	<b>(0.72)</b>
<b>Net GHG Emissions Reduction</b>	<b>2.7</b>
<b>Equivalent Number of Passenger Vehicles<sup>2</sup></b>	<b>600,000</b>

1. Does not include upstream emissions associated with softer binders or recycling agents. See Appendix C for details.
2. Assumes that each vehicle emits 4.6 tonne CO<sub>2e</sub>/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 2009-2022 is estimated to be 28.9 MMT CO<sub>2e</sub>.





**Figure 19: GHG Emissions Reduction from Use of RAP in New Asphalt Mixtures, 2009–2022**

# Other Recycled Materials

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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 2022 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 64 companies from 31 states, 27.2 percent of survey respondents, reported using more than 834,000 tons of other recycled materials in about 8.8 million tons of asphalt mixtures during the 2022 construction season.

## Recycled Tire Rubber

Table 20 summarizes reported information on the use of RTR, also referred to as ground tire rubber (GTR). Eighteen producers from 12 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 80 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 increased approximately 189 percent to 3,274,955 tons (about 1.7 percent of total reported tons for 2022) in the 2022 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, in 2021 (USTMA, 2022). USTMA conducts its scrap tire analysis biennially, the RTR use reported by 2022 construction season survey respondents makes up more than 37 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, 2018–2022**

State	Reported Tons of Asphalt Mixtures Using RTR					Reported Tons of RTR Used				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
Alabama	—	—	—	7300	—	—	—	—	54	—
Arizona	342,000	251,350	214,408	158,135	339,642	4,303	2,554	1,689	1,077	1,698
Arkansas	1,000	—	—	—	—	5	—	—	—	—
California	953,444	706,014	542,718	726,455	2,624,054	13,412	8,587	8,901	11,342	47,416
Delaware	2,500	—	—	—	—	10	—	—	—	—
Florida	9,895	—	—	—	—	136	—	—	—	—
Georgia	63,626	6,667	200,000	102,455	50,000	378	33	1200	675	250
Illinois	125,000	—	15,400	66,755	146,533	750	—	100	583	1,310
Kentucky	—	1,000	—	5,000	2,500	—	5	—	60	8
Louisiana	—	—	—	—	—	—	—	—	—	—
Maine	—	—	—	12,000	—	—	—	—	80	—
Massachusetts	77,000	145,218	172,380	8,000	25,400	710	2,463	2,998	105	352
Michigan	4,500	3,500	80,000	—	5,000	55	5	3,000	—	30
Minnesota	—	—	—	—	250	—	—	—	—	1
Missouri	36,000	30,000	25,000	10,000	9,200	260	1,500	157	70	36
Oklahoma	—	—	15,000	30,000	25,000	—	—	12	300	600
Pennsylvania	—	40,000	69,000	—	—	—	160	890	—	—
Texas	6,280	5,500	9,500	5,025	8,715	98	52	78	60	32
Utah	—	—	—	—	38,661	—	—	—	—	386
Virginia	—	34,000	—	—	—	—	156	—	—	—
<b>Total</b>	<b>1,621,245</b>	<b>1,223,249</b>	<b>1,343,406</b>	<b>1,131,125</b>	<b>3,274,955</b>	<b>20,117</b>	<b>15,515</b>	<b>19,025</b>	<b>14,406</b>	<b>52,146</b>
<b>No. of Companies</b>	<b>21</b>	<b>14</b>	<b>18</b>	<b>20</b>	<b>18</b>					

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 nine states reported using steel slag, and in four states reported using blast furnace slag during the 2022 construction season; in four of these states —Indiana, Michigan, Missouri, 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, rebounding in 2021 by 54 percent, but then declining 41 percent again in 2022 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 2022, which matched 2021, 2020 and 2019.

The U.S. Geologic Survey estimates that about 15.0 million tons of iron and steel slag was sold in 2022, divided as 49 percent blast furnace slag and the remaining percentage being steel slag (USGS, 2023). About 13 percent of this (1.95 million tons) was estimated as used in asphalt pavement mixtures in 2019 (Tuck, 2024). With 776,344 tons of slag materials reported as being used in asphalt mixtures during the 2022 construction season, this survey captures more than 40 percent of total slag estimated to be used in asphalt pavement mixtures. For the states reporting slag use, slightly more than 3 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, 2018–2022**

State & Material	Reported Tons of Mixture Using Material					Reported Tons of Material Used				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
<b>Steel Slag</b>										
Alabama	985,000	985,015	741,000	1,104,097	250,000	195,500	190,252	163,500	225,179	62,500
Arkansas	148,533	63,901	131,500	25,874	147,000	26,658	5,195	24,500	4,770	29,000
Illinois	4,002	1,466	81,000	105,000	25,000	869	450	19,000	31,500	3,000
Indiana	328,214	84,997	194,546	214,614	49,659	110,777	72,937	54,301	63,591	9,492
Iowa	75,000	2,500	30,000	12,500	30,000	13,000	900	7,500	2,500	4,500
Kentucky	—	25,000	—	—	—	—	2,500	—	—	—
Michigan	1,847,249	1,400,000	1,964,335	1,739,824	615,947	225,818	215,000	285,000	121,755	148,189
Minnesota	115,000	102,000	25,000	—	—	20,000	15,000	5,000	—	—
Mississippi	5,000	36,187	120,075	—	—	250	1,394	4,683	—	—
Missouri	38,599	22,430	—	—	25,000	6,431	3,645	—	—	5,000
Ohio	145,000	155,000	225,000	130,000	45,000	30,000	32,000	45,000	28,000	9,000
Tennessee	30,000	—	—	—	—	3,000	—	—	—	—
Washington	395,000	367,000	338,000	350,000	357,000	48,000	36,000	35,000	49,000	48,000
<b>Total</b>	<b>4,116,597</b>	<b>3,245,496</b>	<b>3,850,456</b>	<b>3,681,909</b>	<b>1,544,606</b>	<b>680,303</b>	<b>575,273</b>	<b>643,484</b>	<b>526,295</b>	<b>318,681</b>
No. of Companies	23	14	18	17	13					

<b>Blast Furnace Slag</b>										
Alabama	375,000	252,653	122,000	173,279	—	85,500	54,530	13,500	15,145	—
Illinois	—	505	8,000	—	—	—	100	4,000	—	—
Indiana	1,660,356	972,970	256,356	1,431,913	194,303	548,431	319,465	29,000	434,037	42,916
Iowa	—	1,000	—	12,500	—	—	350	—	2,500	—
Kentucky	150,000	80,000	—	—	—	30,000	20,000	—	—	—
Michigan	470,015	319,449	138,889	1,005,778	1,700,302	110,220	116,670	14,000	183,875	318,045
Mississippi	—	—	—	—	—	—	—	—	—	—
Missouri	1,630	—	—	—	55,000	489	—	—	—	3,000
Ohio	595,263	623,238	590,996	628,558	278,560	149,580	155,758	151,770	156,945	93,702
Pennsylvania	—	—	5,000	—	—	—	—	2,500	—	—
Tennessee	60,000	—	—	—	—	6,000	—	—	—	—
West Virginia	1,052,500	—	—	—	—	137,958	—	—	—	—
<b>Total</b>	<b>4,364,764</b>	<b>2,249,815</b>	<b>1,121,241</b>	<b>3,252,028</b>	<b>2,228,165</b>	<b>1,068,178</b>	<b>666,873</b>	<b>214,770</b>	<b>792,502</b>	<b>457,663</b>
No. of Companies	18	14	13	12	11					

<b>Foundry Sand</b>										
Texas	50,000	—	—	—	—	4,800	—	—	—	—

— = No Use Reported



**Table 22: Recycled Fibers, 2018–2022**

State & Material	Reported Tons of Mixture Produced Using Recycled Fibers*					Reported Tons of Other Recycled Fibers*				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
<b>Cellulose Fibers</b>										
Alabama	196,000	4,232	132,817	40,000	100,000	655	18	773	90	55
Arkansas	250	—	600	—	—	1	—	2	—	—
California	36,865	33,621	57,148	43,726	98,350	55	109	86	22	49
Colorado	—	—	—	—	59,335	—	—	—	—	130
Connecticut	500	—	2200	1,758	1,102	2	—	7	1	1
Delaware	12,000	—	15,000	20,000	15,000	36	—	500	6	15
Dist. of Columbia	1,006	28,000	1,065	500	—	5	100	4	1	—
Florida	193,450	35,500	—	161,300	324,918	362	124	—	484	749
Georgia	370,934	304,877	425,000	113,384	93,300	1,170	1,045	1,300	304	189
Idaho	1,500	—	—	—	—	5	—	—	—	—
Illinois	—	—	442,900	90,131	109,995	—	—	1,320	283	250
Kentucky	35,000	—	—	—	150,000	105	—	—	—	150
Louisiana	—	—	—	—	1,000	—	—	—	—	2
Maryland	138,000	—	115,000	65,000	65,000	414	—	2090	87	150
Massachusetts	—	—	350	—	—	—	—	1	—	—
Michigan	151,728	152,865	60,000	4,100	15,000	231	174	80	4	35
Minnesota	14,000	12,000	152,200	5,800	4,700	22	100	506	2	3
Mississippi	60,000	133,236	218,794	18,899	71,324	400	513	534	57	146
Missouri	136,000	36,458	153,000	63,400	55,000	3,108	166	325	190	128
New York	500	1,160	9,000	1,000	—	1	5	5	1	—
North Carolina	—	—	—	—	3,000	—	—	—	—	7
North Dakota	—	—	60,000	—	—	—	—	180	—	—
Ohio	16,750	1,350	—	—	—	50	3	—	—	—
Oklahoma	—	—	47,000	—	45,000	—	—	26	—	110
Oregon	—	50,000	—	—	—	—	165	—	—	—
Pennsylvania	84,300	17,717	63,880	5,000	11,000	211	52	540	10	17
South Dakota	—	—	—	20,000	—	—	—	—	65	—
Tennessee	27,000	—	—	16,000	41,430	180	—	—	48	92
Texas	79,700	215,000	63,000	50,016	177,000	554	235	13	146	198
Utah	149,135	277,000	128,400	71,301	500	746	530	302	213	1
Virginia	116,000	90,000	50,000	55,500	137,224	348	271	50	167	337
Washington	5,000	—	—	100,000	—	100	—	—	300	—
Wisconsin	—	—	52,000	500	67,000	—	—	104	1	133
<b>Carbon Fibers</b>										
Washington	2,000	—	—	—	—	50	—	—	—	—
<b>Total</b>	<b>1,004,206</b>	<b>1,825,618</b>	<b>1,393,016</b>	<b>2,249,354</b>	<b>1,646,178</b>	<b>8,761</b>	<b>3,610</b>	<b>8,748</b>	<b>2,482</b>	<b>2,947</b>
<b>No. of Companies</b>	<b>43</b>	<b>28</b>	<b>42</b>	<b>31</b>	<b>34</b>					

\*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 2022 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 12,663 tons of fly ash, no bottom ash, no boiler slag, and no FGD material from dry scrubbers and others were used as mineral filler in asphalt in 2022 (ACAA, 2023). Fly ash usage reported for the 2022 construction season survey is about 18 percent of total fly ash used as a mineral filler in asphalt pavements; however, only a very



small amount (0.005 percent) of the 46.8 million tons of coal combustion products produced in 2022 were used in asphalt mixtures, according to ACAA (2023). Unlike with slags, there has not been an 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, 2018–2022**

State & Material	Reported Tons of Asphalt Mixtures Using CCP*					Reported Tons of CCP Used*				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
<b>Fly Ash</b>										
Alabama	160,000	—	51,417	—	—	5,100	—	2,007	—	—
Georgia	3,068	—	50,000	—	—	53	—	2,000	—	—
Illinois	—	—	12,000	—	—	—	—	300	—	—
Michigan	—	30,000	—	—	—	—	700	—	—	—
Mississippi	—	39,687	120,075	—	—	—	1,076	3,242	—	—
Missouri	—	—	110,000	—	—	—	—	2,334	—	—
North Dakota	—	—	60,000	—	—	—	—	2,400	—	—
South Carolina	—	—	—	10,000	30,550	—	—	—	700	1,528
South Dakota	—	—	—	20,000	—	—	—	—	400	—
Texas	110,000	175,000	—	—	—	3,300	8,750	—	—	—
Utah	—	—	—	16,000	—	—	—	—	600	—
Wisconsin	60,000	—	32,000	—	10,400	3,600	—	1,600	—	775
<b>Total (All CCP)</b>	<b>333,068</b>	<b>244,687</b>	<b>435,492</b>	<b>46,000</b>	<b>40,950</b>	<b>12,053</b>	<b>10,526</b>	<b>13,883</b>	<b>1,700</b>	<b>2,303</b>
<b>No. of Companies</b>	<b>5</b>	<b>4</b>	<b>8</b>	<b>3</b>	<b>2</b>					

\*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 2022 construction season producers reported using recycled toner pellets, and LDPE. In previous years, producers have also reported the use of blasting sand, plant start-up waste, crushed concrete aggregate, marble production dust, recycled glass, and petroleum-contaminated soil in asphalt pavement mixtures.

**Table 24: Other Recycled Materials, 2018–2022**

State & Material	Reported Tons of Mixture Produced Using Other Recycled Material*					Reported Tons of Other Recycled Material Used*				
	2018	2019	2020	2021	2022	2018	2019	2020	2021	2022
<b>Blasting Sand</b>										
South Carolina	—	—	25,000	—	—	—	—	5,000	—	—
<b>Crushed Concrete Aggregates</b>										
Florida	10,000	—	—	—	—	1,000	—	—	—	—
<b>Marble Production Dust</b>										
Georgia	—	—	50,000	—	—	—	—	500	—	—
<b>Plant Start-Up Waste</b>										
Missouri	15,000	—	5,000	6,000	—	4,000	—	500	600	—
<b>Recycled Toner Pellets</b>										
Virginia	—	—	—	125,200	113,250	—	—	—	375	340
<b>Recycled Polyethylene &amp; LDPE (rPE)</b>										
Louisiana	—	—	—	—	1,000	—	—	—	—	5
Pennsylvania	—	—	—	1,600	—	—	—	—	1	—
Wisconsin	—	—	1,000	—	—	—	—	5	—	—
<b>Total</b>	<b>25,000</b>	<b>—</b>	<b>81,000</b>	<b>132,800</b>	<b>114,250</b>	<b>5,000</b>	<b>—</b>	<b>6,005</b>	<b>976</b>	<b>345</b>

\* 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

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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 2022 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 38 companies, from the four User Producer Group regions, reported using more than 11.1 million tons of recycled asphalt pavement while completing the in-place recycling process during the 2022 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 2022 construction season. The North Central Asphalt User/Producer Group (NCAUPG) region had the most respondents (18 companies); the region also accounted for 31 percent of the in-place recycling tonnage reported for 2022. The NCAUPG region had tonnage reported for all four techniques with FDR being 51 percent and the highest tonnage for the region. The North East Asphalt User/Producer Group (NEAUPG) had the lowest response rate, 3 respondents, to the in-place recycling survey in 2022. 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 5 and 12 companies respond respectively. The combined RMAUPG and PCCAS regions had tonnage reported for all four techniques, while the SEAUPG region had no reported tonnage for CCPR. The total reported tonnage was up (131 percent) from 4.8 million tons in 2021, to 11.1 million tons in 2022, with responses increasing (52 percent) from 25 companies in 2021 to 38 companies in 2022.

Region	Companies	(tons)			
		HIR	CCPR	CIR	FDR
NCAUPG	18	287,280	75,000	1,330,000	1,766,305
SEAUPG	5	148,960	0	52,235	53,200
RMAUPG / PCCAS	12	173,600	20,000	1,564,125	791,422
NEAUPG	3	0	20,000	2,359,600	2,500,000
<b>2022 Totals</b>	<b>38</b>	<b>609,840</b>	<b>115,000</b>	<b>5,305,960</b>	<b>5,110,927</b>
<b>2021 Totals</b>	<b>25</b>	<b>50,000</b>	<b>93,205</b>	<b>1,669,084</b>	<b>3,013,494</b>
<b>2020 Totals</b>	<b>21</b>	<b>430,682</b>	<b>494,500</b>	<b>1,317,655</b>	<b>1,461,807</b>
<b>2019 Totals</b>	<b>28</b>	<b>319,600</b>	<b>8,400</b>	<b>2,100,952</b>	<b>1,830,416</b>

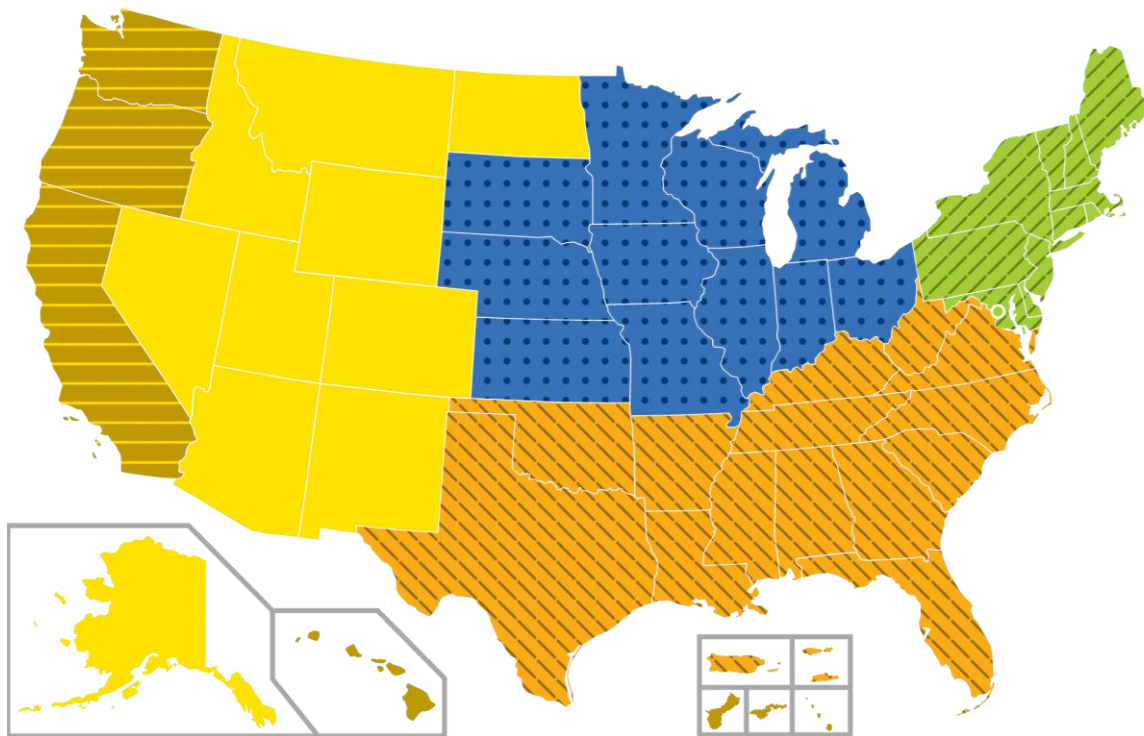


Figure 22: In-place Recycling Tonnages, 2022

## 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 2022 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 20 percent in terms of company responses and 27 percent in terms of plant production facilities for the 2009 to 2022 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 42 percent overall increase in average percent RAP, starting at 15.6 percent RAP in 2009 and reaching 22.2 percent in 2022. 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 steadily decreased in utilization for all sectors through 2020, but then had a 7 percent increase in utilization for the 2021 and 2022 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 growth in all sectors since 2009, with the accumulated growth over the history of the survey in 2022 of more than 941 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 34 percent and chemical additives at 64 percent in 2022.
- 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

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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 2022 construction season. Asphalt mixture producers from 50 states and the District of Columbia completed the 2022 survey. Responses came from 235 companies with data from 1,305 production plants. Data collected was compared to annual data from previous surveys since the 2009 construction season.

The survey findings for 2022 regarding the use of RAP, RAS, and WMA are summarized in Table 4.

Comparing the 2022 results to 2021 construction season, estimated total asphalt mixture production saw an increase to 441.9 million tons from 432.4 million tons, a 2 percent increase. DOT tonnage decreased 0.8 percent, mixture production for the Other Agency sector increased by 4.8 percent, and the Commercial and Residential sector also increased by 3.6 percent from 2021 to 2022.

The use of RAP has risen dramatically since the 2009 construction season survey; 2022 saw an increase in RAP tonnage used in asphalt mixtures of 3.7 percent above 2021, which was driven by both increased asphalt mixture tonnage in 2022 and an increase (0.3 percent) in the average percentage of RAP utilized in the production of new asphalt mixtures.

The 2022 construction season survey shows:

## Reclaimed Asphalt Pavement

- The total estimated tons of RAP used in asphalt mixtures was 98.1 million tons in 2022. This represents a 75.2 percent increase in the total estimated tons of RAP used in 2009. During the same time frame, total asphalt mixture tonnage increased only 23.3 percent.
- The percentage of producers reporting use of RAP was 100 percent of respondents which matched 2021.
- The average percent RAP used by all sectors has seen variable growth from 2009 to 2022. The average estimated percentage of RAP used in asphalt mixtures has increased from 15.6 percent in 2009 to 22.2 percent in 2022.
- Companies reporting having stockpiled RAP on hand at year-end decreased from 97.7 percent in 2021 to 97.4 percent in 2022. In total, producers accepted an estimated 112.6 million tons and used an estimated 104.8 million tons in 2022.
- Reclaiming 112 million tons of RAP for future use saved about 68.2 million cubic yards of landfill space.
- The total estimated amount of RAP stockpiled nationwide at the end of the 2022 construction season was 154 million tons.
- Producers from 28 states reported fractionating RAP. Nationally, a reported 20 percent of RAP is fractionated.
- Producers from 24 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 (7 percent) from an estimated 630,000 tons in 2021 to 673,000 tons in 2022.
- The amount of unprocessed RAS accepted by asphalt mixture producers increased from 395,000 tons in 2021 to 641,000 tons in 2022. An estimated 356,000 tons of processed RAS was also accepted by producers, which was about 29,000 tons less processed RAS than was accepted in 2021. The combined amount of unprocessed and processed RAS accepted in 2022 was 997,000 tons, which was 324,000 tons more RAS than was used for all purposes during the 2022 construction season.
- Of the unprocessed RAS accepted by producers in 2022, 483,000 tons was PCAS and 158,000 tons was MWAS.
- Of the RAS used in 2022, 100 percent of the reported use was in asphalt mixtures. No producers reported use in other civil engineering applications or landfilling of RAS during the 2022 construction season.
- The percent of producers reporting use of RAS decreased from 24.9 percent of respondents in 2021 to 21.2 percent in 2022.
- The total estimated amount of RAS stockpiled nationwide at the end of the 2022 construction season was 1.43 million tons.
- Accepting 641,00 tons of unprocessed RAS from both PCAS and MWAS sources diverted about 390,000 cubic yards of material from landfills.
- The number of states with producers reporting RAS use was 25 in 2022. Iowa and Virginia producers continue to report 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 14 states reported using softer binders and five states reported using recycling agents in RAS mixtures.

## Material Cost Savings

- The use of RAP and RAS saved more than \$4.7 billion during the 2022 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 2022 construction season saved more than 68 million cubic yards of space in construction and demolition landfills, as well as more than \$5.7 billion in gate fees associated with the disposal of RAP and RAS.

## Other Recycled Materials

- A reported total of more than 834,000 tons of other recycled materials was used in about 8.8 million tons of asphalt mixtures by 64 companies in 31 states during the 2022 construction season.
- Eighteen producers from 12 states reported use of recycled tire rubber (RTR) in asphalt mixtures during the 2022 construction season. The total reported tons of asphalt mixture using RTR increased 189 percent from 2021 to 3,274,955 tons in the 2022 construction season.
- Producers in 9 states reported use of steel or blast furnace slags, and no states reported the use of foundry sand in 2022. Compared to reported use in 2021, the reported tons of mixtures including steel slag and mixtures including blast furnace slag decreased 41 percent during the 2022 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 two states reported using fly ash in asphalt mixtures in 2022. Fly ash was the only coal combustion product (CCP) reported as being used in asphalt pavement mixtures during the 2022 construction season.
- Producers in 23 states reported use of more than 2,900 tons of recycled cellulose fiber in more than 1.6 million tons of asphalt pavement mixtures during 2022.

## Warm Mix Asphalt

The use of WMA technologies has increased significantly since 2009. The 2022 construction season survey shows:

- The estimated total tonnage of asphalt pavement mixtures produced with WMA technologies for the 2022 construction season was about 175.0 million tons. This was a 1.6 percent decrease from the estimated 177.9 million tons of mixture produced with WMA technologies in 2021 and a more than 941 percent increase from the estimated 16.8 million tons in the 2009 construction season.
- Mixtures produced with WMA technologies made up 39.6 percent of the total estimated asphalt mixture market in 2022. About 59.4 percent (103.9 million tons) of these mixtures were produced with a temperature reduction of at least 10°F.
- In addition, producers using WMA technologies in five states — Colorado, Connecticut, Massachusetts, Oregon, and Pennsylvania — reported producing more than 75 percent of their total tonnage with WMA technologies.
- Production plant foaming, representing nearly 34 percent of the market in 2022, was again the second most commonly used warm-mix technology, with utilization decreasing about 64.8 percent since its peak in the 2011 construction season.
- Chemical additive technologies accounted for 64 percent of the market in 2022, a 6 percent increase from their use in the 2021 construction season.
- The decrease in plant-based foaming technologies has been seen in the survey since 2011.



- There appears to be some variation in the use of WMA technology based upon production temperature.
- About 61 percent of survey respondents reported producing asphalt mixture with WMA technologies; 144 producers in 44 states reported using WMA technologies.

## Conclusions

The 2022 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 7.8 million tons more than what producers utilized during the 2022 construction season, with 97.4 percent of producers indicated they have stockpiled RAP on hand. With an estimated 154.5 million tons of RAP stockpiled nationwide at year-end 2022, 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 2022 in asphalt pavement mixtures; by accepting 641,000 tons of waste shingles during 2022, producers diverted about 4.2 percent of the nation's available waste shingles for use in asphalt mixtures. An estimated 1.43 million tons of RAS was stockpiled nationwide at year-end 2022. 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 2022 construction season, slag use was reported in 9 states, RTR use was reported in 12 states, recycled cellulose use was reported in 23 states, and fly ash use in two states.

The tonnage of asphalt pavement mixtures produced with WMA technologies saw a 1.6 percent decrease during the 2022 construction season with a total production of 175.0 million tons, which represents 39.6 percent of total estimated asphalt mixture production for the year. Producers in Alabama, Alaska, Hawaii, Iowa, Montana, Nebraska, Rhode Island, South Dakota, and Vermont reported not producing mixtures with WMA technologies in 2022.

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## **13<sup>th</sup> Annual Asphalt Pavement Industry Survey IS 138**







# Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage 2022

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IS-138 Appendix A:  
Methodology & Survey Forms

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13th Annual Survey

# Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2022

## Appendix A

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Appendix A to the thirteenth edition of *Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage* (Williams et al., 2024) provides details on the methodology used to collect and analyze the 2022 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 2022, 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 2022 construction season survey, the following tasks were conducted:

1. Develop a survey instrument that enables an analysis of the quantities of recycled materials used in asphalt mixtures and 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 federal-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 2022 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 2022 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, 2022**

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 $\geq 10^{\circ}\text{F}$ 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 $\geq 10^{\circ}\text{F}$ 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 $\geq 10^{\circ}\text{F}$ 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 $10^{\circ}\text{F} - 30^{\circ}\text{F}$ , $31^{\circ}\text{F} - 50^{\circ}\text{F}$ , $\geq 50^{\circ}\text{F}$ reduction	Tons of Each Other Recycled Product Used
DOT Tons	Tons Used in Other	Tons Used in Aggregate Base	Chemical Admixture % With $\geq 10^{\circ}\text{F}$ Reduction	
Other Agency Tons	Tons Landfilled	Tons Used in Cold-Mix Asphalt	Additive Foaming % With $\geq 10^{\circ}\text{F}$ Reduction	
Commercial & Residential Tons	Average % for DOT Mixtures	Tons Used in Other	Production Plant Foaming % With $\geq 10^{\circ}\text{F}$ Reduction	
	Average % for Other Agency Mixtures	Tons Landfilled	Organic Additive % With $\geq 10^{\circ}\text{F}$ 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 few 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, 2022**

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, 2022**

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)

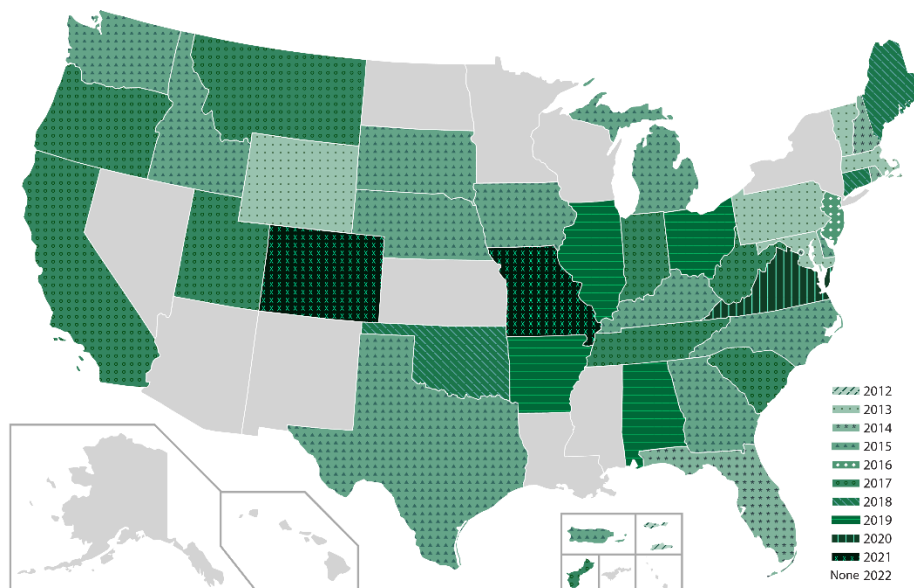
## Data Estimation Method

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 28 states, totaling more than 330 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 FY2022 federal-aid highway apportionment (FHWA, 2024) 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.

$$\text{Total Estimated Tons} = [0.01 \times (\text{State Federal Apportionment})] - 228,573 \quad [A1]$$

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, 2024). 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 FY2022 funding levels (FHWA, 2024).



**Figure A1: States Approving Measures to Increase and/or Dedicate Transportation Funding, 2012–2022**

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.

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## 2022 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...

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

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](mailto: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](mailto: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**



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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?**

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

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

Number of plants



Total Asphalt Tonnage for 2022

Please complete the following information for the total tonnage of all asphalt production in 2022.

**\* 8. What was your total tonnage of asphalt mixes in 2022 for the following sectors? (Use best estimate if data is not available.)**

State DOT:

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

Commercial & Residential



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RAP Supply and Use 2022

Please complete the following information on the amount of RAP received and used for 2022.

\* **9. Did you accept, process, or use RAP in the state during 2022?**

- Yes
- No

RAP Supply and Use 2022

Please complete the following information regarding the amount of RAP received and used for 2022.

**\* 10. How many tons of reclaimed asphalt pavement and asphalt millings were accepted/delivered to your facilities in the state in 2022?**

Tons:

**\* 11. How many tons of RAP were used in 2022 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 2022 for the following sectors? (Use best estimate if data not available.)**

State DOT:

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

Commercial & Residential



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RAP Supply and Use 2022

\* 13. At the end of the year 2022 did you have excess RAP (processed or unprocessed) in inventory?

- Yes
- No

\* 14. Please estimate how many tons of RAP you had stockpiled at the end of 2022. (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.)

- \* **18. Did you accept waste shingles and/or process or use reclaimed asphalt shingles (RAS) in 2022?**
- Yes
  - No



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Reclaimed Asphalt Shingles (RAS) Supply and Use for 2022

Please complete the following information regarding the amount of waste shingles received (processed and unprocessed) and used during 2022.

**\* 19. How many tons of shingles were accepted/delivered to your facilities in the state in 2022?**

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 2022? (Use best estimate if data not available.)**

Recycled into HMA/WMA Mixes:

Aggregate Base:

Cold Mix:

Other:

Landfilled:



Reclaimed Asphalt Shingles (RAS) Supply and Use for 2022

\* 21. What was average RAS percentage used in asphalt mixes in 2022 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 2022 did you have any surplus RAS stockpiled? (Include processed and unprocessed shingles.)

- Yes
- No

\* 23. Please estimate how many tons of RAS you had stockpiled at the end of 2022. (Use best estimate if data not available.)

\* 24. Is RAS allowed in

	ALL	SOME	NONE
DOT mixes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other Agency mixes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Commercial and Residential mixes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 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 2022. (Use best estimate if data not available.)



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## Warm-Mix Asphalt Production for 2022

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 2022?**

- Yes
- No

Warm-Mix Asphalt Production for 2022

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 2022 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 2022 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:



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Warm-Mix Asphalt Production for 2022

**\* 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 2022 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:

## Other Recycled Material for 2022

Please let us know if you used any other recycled materials in HMA/WMA mixes in 2022.

**\* 33. Did you use other recycled materials (excluding RAP and RAS) in your mixes in 2022?**

**(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.)**

- Yes
- No



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Other Recycled Material for 2022

\* 34. What other recycled material (excluding RAP and RAS) did you use in your mixes in 2022?

	ALL	SOME	NONE
Ground Tire Rubber	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Steel Slag	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Blast Furnace Slag	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Recycled Cellulose Fibers	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other 1*	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other 2*	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

\* 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	



Other Recycled Material for 2022

\* 36. How many tons of the recycled product was used in 2022? (Enter 0 if you do not have a reasonable estimate of this quantity)

Ground Tire Rubber	<input type="text"/>
Steel Slag	<input type="text"/>
Blast Furnace Slag	<input type="text"/>
Recycled Cellulose	<input type="text"/>
Other 1	<input type="text"/>
Other 2	<input type="text"/>



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Thank You

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

- Yes
- 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 2022. The link to the survey is here:

[2022 IPR Survey](#) Thank you for your time in helping document some of the asphalt industries efforts in sustainability and recycling.

## 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, 2023, to assist NAPA in preparing the 2022 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](mailto:bwilliams@asphaltpavement.org) or NAPA by phone at 888-468-6499 if you have any questions.

\* **38. Association Name:**

### Contact

\* **39. Name:**



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SAPA Information

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

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

\* 41. What is your best estimate of the total tons of asphalt mixture placed in your state in 2022? (This includes asphalt mixture tonnage for all sectors, ex. DOT, Other Agencies, Commercial & Residential) [2022 Estimates are provided below for your reference.]

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	*	*
<b>Total</b>					<b>432.4</b>	<b>198.1<sup>†</sup></b>	<b>46%</b>

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



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SAPA Information

\* 42. Tonnage Estimate Comments

[Empty text box for comments]

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

- Yes
- No

\* 44. Is RAS allowed in

	ALL	SOME	NONE
DOT mixes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Other Agency mixes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Commercial and Residential mixes	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments:

[Empty text box for 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	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Softer Binders	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Comments:

[Empty text box for comments]



## 2022 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.



## 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](mailto: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**

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

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



Total Quantities for 2022

Please complete the following information for the total quantities of all CIR, HIR, CCPR, and FDR in 2022.

**\* 6. What was your state-wide total quantity of in-place recycling in 2022? (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)

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

- Yes
- No



NATIONAL ASPHALT  
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### **National Asphalt Pavement Association**

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### **13<sup>th</sup> Annual Asphalt Pavement Industry Survey IS 138 — Appendix A**









# Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage 2022

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

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# Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2022

## 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 2022 construction season survey (Williams et al., 2024), 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 235 companies representing 1,305 production plants responded to the 2022 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 2022 construction season survey versus prior-year survey respondents. Approximately 76 percent of 2021 responding companies participated in the 2022 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 2022 Construction Season Survey in Each State/Territory**

State	Cos.	Prod. Plants	State	Cos.	Prod. Plants	State	Cos.	Prod. Plants
Alabama	4	38	Kentucky	8	51	Ohio	12	69
Alaska	*	*	Louisiana	*	*	Oklahoma	7	27
American Samoa	NCR	NCR	Maine	3	16	Oregon	3	21
Arizona	*	*	Maryland	6	14	Pennsylvania	8	51
Arkansas	7	21	Massachusetts	4	23	Puerto Rico	NCR	NCR
California	4	45	Michigan	9	51	Rhode Island	*	*
Colorado	5	16	Minnesota	6	42	South Carolina	8	35
Connecticut	*	*	Mississippi	3	24	South Dakota	*	*
Delaware	*	*	Missouri	5	27	Tennessee	8	33
District of Columbia	*	*	Montana	*	*	Texas	4	54
Florida	4	38	Nebraska	*	*	U.S. Virgin Islands	NCR	NCR
Georgia	5	50	Nevada	*	*	Utah	6	13
Guam	NCR	NCR	New Hampshire	*	*	Vermont	*	*
Hawaii	*	*	New Jersey	3	17	Virginia	12	51
Idaho	6	21	New Mexico	*	*	Washington	6	23
Illinois	16	42	New York	9	50	West Virginia	3	15
Indiana	6	41	North Carolina	10	89	Wisconsin	4	74
Iowa	3	11	North Dakota	*	*	Wyoming	*	*
Kansas	3	19	No. Mariana Islands	NCR	NCR	<b>Total†</b>	235	1305

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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	5.5	3.8	7.0	7.0
	DOT	3.5	2.4	4.4	4.5
	Other Agency	1.1	0.6	1.5	1.1
	Commercial & Residential	0.9	0.8	1.1	1.4
	No. of Companies Reporting	7	4		
<b>RAP</b> (Tons, Millions)	Accepted	1.4	0.8	1.8	1.4
	Used in HMA/WMA Mixtures	1.4	0.9	1.8	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	1.26	1.57	1.62	2.88
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	24.7%	26.3%		
	Average % for Other Agency Mixtures <sup>1</sup>	25.0%	18.3%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	26.8%	29.5%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			25.7%	24.6%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	35%	45%		
	% of RAP Mixtures Using Softer Binders	0%	0%		
	% of RAP Mixtures Using Recycling Agents	17%	0%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	1.0	0.0	1.3	0.0
	Processed Shingles Accepted	0.0	5.7	0.0	10.5
	Used in HMA/WMA Mixtures	5.0	0.0	6.4	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	5.0	6.5	6.4	11.9
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.06%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.10%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.10%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.09%	0.00%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	14%	0%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	100%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.2 (Tons, Millions)	0.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.5 (Tons, Millions)	0.0 (Tons, Millions)
	DOT	18%	0%	0.8 (Tons, Millions)	0.0 (Tons, Millions)
	Other Agency	40%	0%	0.6 (Tons, Millions)	0.0 (Tons, Millions)
	Commercial & Residential	28%	0%	0.3 (Tons, Millions)	0.0 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	48%	0%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	52%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	29%	0%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	5.5	5.3
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (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		
<b>RAP</b> (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
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Other Agency Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	NCR	NCR		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			NCR	NCR
<b>RAP</b> (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		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Other Agency Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	NCR	NCR		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			NCR	NCR
<b>RAS</b> (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		
<b>WMA</b>	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
<b>WMA Technologies</b> (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		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	3.2	*	7.9	7.8
	DOT	0.2	*	0.5	*
	Other Agency	2.1	*	5.2	*
	Commercial & Residential	0.9	*	2.2	*
	No. of Companies Reporting	3	*		
<b>RAP</b> (Tons, Millions)	Accepted	0.1	*	0.2	*
	Used in HMA/WMA Mixtures	0.1	*	0.3	*
	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 RAP Stockpiled at Year-End	0.87	*	2.13	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	3.0%	*		
	Average % for Other Agency Mixtures <sup>1</sup>	5.1%	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	11.6%	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			4.4%	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	*		
	% of RAP Fractionated	0%	*		
	% of RAP Mixtures Using Softer Binders	40%	*		
	% of RAP Mixtures Using Recycling Agents	33%	*		
<b>RAS</b> (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	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	*		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	0%	*		
	% of RAS Mixtures Using Softer Binders	0%	*		
	% of RAS Mixtures Using Recycling Agents	0%	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			0.1 (Tons, Millions)	*
	Total Tons Produced With WMA Technology at HMA Temperatures			0.3 (Tons, Millions)	*
	DOT	1%	*	0.0 (Tons, Millions)	*
	Other Agency	3%	*	0.2 (Tons, Millions)	*
	Commercial & Residential	10%	*	0.2 (Tons, Millions)	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	100%	*		
	Additive Foaming, % of Market	0%	*		
	Plant Foaming, % of Market	0%	*		
	Organic Additive, % of Market	0%	*		
	% Companies Reporting Using WMA Technologies	67%	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	2.8	2.9	6.0	6.0
	DOT	1.8	1.9	4.0	3.9
	Other Agency	0.5	0.3	1.0	0.6
	Commercial & Residential	0.5	0.7	1.0	1.5
	No. of Companies Reporting	7	7		
<b>RAP</b> (Tons, Millions)	Accepted	0.2	0.2	0.4	0.4
	Used in HMA/WMA Mixtures	0.3	0.4	0.6	0.9
	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	0.32	0.36	0.70	0.75
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	10.9%	14.4%		
	Average % for Other Agency Mixtures <sup>1</sup>	8.2%	16.1%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	12.2%	14.2%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			10.7%	14.5%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	16%	17%		
	% of RAP Mixtures Using Softer Binders	11%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	15.0	15.0	32.6	31.4
	Used in HMA/WMA Mixtures	12.1	9.0	26.4	18.8
	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	17.2	6.0	37.5	12.6
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.44%	0.31%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.44%	0.31%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.44%	0.31%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.44%	0.31%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	29%	14%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			0.7 (Tons, Millions)	1.7 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.0 (Tons, Millions)	0.3 (Tons, Millions)
	DOT	31%	34%	1.2 (Tons, Millions)	1.3 (Tons, Millions)
	Other Agency	33%	55%	0.3 (Tons, Millions)	0.4 (Tons, Millions)
	Commercial & Residential	14%	21%	0.2 (Tons, Millions)	0.3 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	0%	16%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	100%	84%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	43%	57%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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

# CALIFORNIA

Material	Sectors	Reported Values		Estimated Values	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	9.2	9.3	27.2	26.6
	DOT	1.8	2.4	5.5	6.9
	Other Agency	1.0	1.0	3.0	2.8
	Commercial & Residential	6.3	5.9	18.7	16.9
	No. of Companies Reporting	4	4		
<b>RAP</b> (Tons, Millions)	Accepted	1.5	1.8	4.4	5.2
	Used in HMA/WMA Mixtures	1.5	1.5	4.5	4.4
	Used as Aggregate	0.0	0.1	0.1	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	0.99	0.65	2.92	1.86
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	15.0%	15.8%		
	Average % for Other Agency Mixtures <sup>1</sup>	12.5%	12.5%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	21.3%	19.3%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			16.6%	16.6%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	19%	26%		
	% of RAP Mixtures Using Softer Binders	0%	15%		
	% of RAP Mixtures Using Recycling Agents	32%	40%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	6.3	0.1	18.7	0.3
	Used in HMA/WMA Mixtures	6.7	0.1	19.8	0.1
	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	0.0	0.9	0.0	2.4
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.08%	0.02%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.08%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.07%	0.00%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	50%	25%		
	% of RAS Mixtures Using Softer Binders	50%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			16.5 (Tons, Millions)	8.4 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			3.4 (Tons, Millions)	0.4 (Tons, Millions)
	DOT	92%	79%	5.0 (Tons, Millions)	5.5 (Tons, Millions)
	Other Agency	31%	28%	0.9 (Tons, Millions)	0.8 (Tons, Millions)
	Commercial & Residential	75%	15%	14.0 (Tons, Millions)	2.5 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	87%	62%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	13%	38%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	100%	100%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	3.6	2.4	9.1	9.4
	DOT	0.7	0.8	1.9	3.2
	Other Agency	1.3	0.8	3.3	3.2
	Commercial & Residential	1.5	0.8	3.9	3.0
	No. of Companies Reporting	6	5		
<b>RAP</b> (Tons, Millions)	Accepted	0.7	0.7	1.8	2.9
	Used in HMA/WMA Mixtures	0.8	0.4	2.0	1.7
	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	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.31	0.80	0.77	3.16
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	20.1%	16.4%		
	Average % for Other Agency Mixtures <sup>1</sup>	18.2%	18.0%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	26.2%	22.0%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			21.6%	18.5%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	34%	16%		
	% of RAP Mixtures Using Softer Binders	5%	5%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.00%
<b>RAS</b> (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%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.8 <small>(Tons, Millions)</small>	0.9 <small>(Tons, Millions)</small>
	Total Tons Produced With WMA Technology at HMA Temperatures			0.4 <small>(Tons, Millions)</small>	6.0 <small>(Tons, Millions)</small>
	DOT	19%	32%	0.4 <small>(Tons, Millions)</small>	1.0 <small>(Tons, Millions)</small>
	Other Agency	36%	100%	1.2 <small>(Tons, Millions)</small>	3.2 <small>(Tons, Millions)</small>
	Commercial & Residential	15%	89%	0.6 <small>(Tons, Millions)</small>	2.7 <small>(Tons, Millions)</small>
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	100%	86%		
	Additive Foaming, % of Market	0%	2%		
	Plant Foaming, % of Market	0%	11%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	83%	100%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	3.0	5.2
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	1.6	1.6
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	1.5	1.5
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	7.4	8.0	19.0	19.0
	DOT	2.1	3.1	5.3	7.3
	Other Agency	1.7	2.0	4.4	4.8
	Commercial & Residential	3.6	2.9	9.3	6.8
	No. of Companies Reporting	5	4		
<b>RAP</b> (Tons, Millions)	Accepted	2.2	2.5	5.6	5.8
	Used in HMA/WMA Mixtures	2.3	2.7	6.0	6.4
	Used as Aggregate	0.1	0.0	0.2	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	2.04	1.81	5.21	4.29
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	29.2%	29.0%		
	Average % for Other Agency Mixtures <sup>1</sup>	29.4%	33.0%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	33.9%	37.0%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			31.5%	33.8%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	4%	3%		
	% of RAP Mixtures Using Softer Binders	62%	74%		
	% of RAP Mixtures Using Recycling Agents	13%	16%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	10.0	0.0	23.7
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	0.0	5.0	0.0	11.8
	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	5.0	0.0	11.8
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.10%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.06%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	0%	25%		
	% of RAS Mixtures Using Softer Binders	0%	100%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			2.1 (Tons, Millions)	0.4 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.8 (Tons, Millions)	6.6 (Tons, Millions)
	DOT	40%	61%	2.1 (Tons, Millions)	4.5 (Tons, Millions)
	Other Agency	21%	30%	0.9 (Tons, Millions)	1.4 (Tons, Millions)
	Commercial & Residential	9%	16%	0.9 (Tons, Millions)	1.1 (Tons, Millions)
<b>WMA Technologies</b> (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	60%	50%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	6.5	6.9	14.5	14.1
	DOT	2.6	2.8	5.7	5.7
	Other Agency	1.9	2.1	4.1	4.2
	Commercial & Residential	2.1	2.0	4.7	4.1
	No. of Companies Reporting	5	5		
<b>RAP</b> (Tons, Millions)	Accepted	2.1	2.2	4.8	4.5
	Used in HMA/WMA Mixtures	2.0	2.1	4.5	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	2.25	3.06	5.03	6.27
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	29.4%	29.6%		
	Average % for Other Agency Mixtures <sup>1</sup>	29.0%	27.6%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	32.3%	30.2%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			31.1%	29.8%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	33%	0%		
	% of RAP Mixtures Using Softer Binders	0%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
<b>RAS</b> (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	14.5	0.0	32.5	0.0	
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.00%
<b>RAS</b> (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%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			0.0 (Tons, Millions)	3.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.0 (Tons, Millions)	0.0 (Tons, Millions)
	DOT	0%	32%	0.0 (Tons, Millions)	1.8 (Tons, Millions)
	Other Agency	0%	22%	0.0 (Tons, Millions)	0.9 (Tons, Millions)
	Commercial & Residential	0%	6%	0.0 (Tons, Millions)	0.3 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	0%	100%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	0%	20%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (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		
<b>RAP</b> (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
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Other Agency Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	NCR	NCR		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			NCR	NCR
<b>RAP</b> (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		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Other Agency Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	NCR	NCR		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			NCR	NCR
<b>RAS</b> (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		
<b>WMA</b>	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
<b>WMA Technologies</b> (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		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	0.6	*	1.0	1.0
	DOT	0.3	*	0.5	*
	Other Agency	0.2	*	0.3	*
	Commercial & Residential	0.1	*	0.2	*
	No. of Companies Reporting	3	*		
<b>RAP</b> (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	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	17.7%	*		
	Average % for Other Agency Mixtures <sup>1</sup>	14.0%	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	22.4%	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			18.4%	*
<b>RAP</b> (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%	*		
<b>RAS</b> (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	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	*		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	0%	*		
	% of RAS Mixtures Using Softer Binders	0%	*		
	% of RAS Mixtures Using Recycling Agents	0%	*		
<b>WMA</b>	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)	*
<b>WMA Technologies</b> (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%	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	1.3	1.8	3.0	3.0
	DOT	0.5	1.1	1.2	1.8
	Other Agency	0.4	0.3	0.9	0.6
	Commercial & Residential	0.4	0.4	0.9	0.6
	No. of Companies Reporting	5	6		
<b>RAP</b> (Tons, Millions)	Accepted	0.3	0.5	0.8	0.9
	Used in HMA/WMA Mixtures	0.3	0.6	0.8	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	0.59	0.63	1.39	1.03
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	28.2%	27.3%		
	Average % for Other Agency Mixtures <sup>1</sup>	25.0%	30.2%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	26.6%	39.3%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			26.1%	32.6%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	20%	0%		
	% of RAP Mixtures Using Softer Binders	87%	58%		
	% of RAP Mixtures Using Recycling Agents	0%	3%		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.00%
<b>RAS</b> (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%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			0.6 (Tons, Millions)	0.6 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.6 (Tons, Millions)	0.5 (Tons, Millions)
	DOT	51%	41%	0.6 (Tons, Millions)	0.7 (Tons, Millions)
	Other Agency	12%	24%	0.1 (Tons, Millions)	0.1 (Tons, Millions)
	Commercial & Residential	53%	39%	0.5 (Tons, Millions)	0.3 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	49%	82%		
	Additive Foaming, % of Market	17%	0%		
	Plant Foaming, % of Market	34%	18%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	60%	67%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	7.2	6.7	14.9	14.7
	DOT	2.3	2.1	4.8	4.5
	Other Agency	2.4	1.6	5.0	3.6
	Commercial & Residential	2.5	3.0	5.1	6.6
	No. of Companies Reporting	18	16		
<b>RAP</b> (Tons, Millions)	Accepted	2.5	2.3	5.2	5.1
	Used in HMA/WMA Mixtures	2.0	2.0	4.1	4.3
	Used as Aggregate	0.4	0.1	0.8	0.3
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.0
	Used in Other	0.1	0.1	0.1	0.3
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	1.16	1.66	2.39	3.63
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	24.5%	20.5%		
	Average % for Other Agency Mixtures <sup>1</sup>	27.4%	25.8%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	28.9%	32.9%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			27.8%	29.1%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	61%	61%		
	% of RAP Mixtures Using Softer Binders	63%	44%		
	% of RAP Mixtures Using Recycling Agents	9%	4%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	3.1	2.0	6.4	4.4
	Processed Shingles Accepted	72.3	23.2	149.2	50.9
	Used in HMA/WMA Mixtures	84.1	25.2	173.5	55.3
	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	3.5	2.7	7.2	5.9
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	1.03%	0.68%		
	Average % for Other Agency Mixtures <sup>1</sup>	1.52%	0.40%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	1.14%	0.21%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			1.16%	0.38%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	61%	44%		
	% of RAS Mixtures Using Softer Binders	54%	43%		
	% of RAS Mixtures Using Recycling Agents	4%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			2.0 (Tons, Millions)	6.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			2.8 (Tons, Millions)	0.8 (Tons, Millions)
	DOT	27%	43%	1.3 (Tons, Millions)	1.9 (Tons, Millions)
	Other Agency	43%	46%	2.2 (Tons, Millions)	1.7 (Tons, Millions)
	Commercial & Residential	26%	49%	1.3 (Tons, Millions)	3.2 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	64%	100%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	36%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	50%	44%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	10.3	7.0	14.0	14.5
	DOT	4.2	2.7	5.7	5.5
	Other Agency	3.0	2.2	4.1	4.6
	Commercial & Residential	3.1	2.1	4.2	4.4
	No. of Companies Reporting	6	6		
<b>RAP</b> (Tons, Millions)	Accepted	2.7	1.8	3.6	3.7
	Used in HMA/WMA Mixtures	2.4	1.7	3.3	3.5
	Used as Aggregate	0.2	0.0	0.2	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	3.71	1.22	5.05	2.51
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	23.0%	23.2%		
	Average % for Other Agency Mixtures <sup>1</sup>	23.5%	24.7%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	24.8%	24.7%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			23.4%	24.4%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	51%	35%		
	% of RAP Mixtures Using Softer Binders	1%	1%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	6.0	0.0	8.2	0.0
	Processed Shingles Accepted	0.4	0.0	0.5	0.0
	Used in HMA/WMA Mixtures	6.2	1.0	8.4	2.1
	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	2.3	2.6	3.1	5.3
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.06%	0.01%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.06%	0.01%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.06%	0.01%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.06%	0.01%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	50%	50%		
	% of RAS Mixtures Using Softer Binders	0%	34%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.0 (Tons, Millions)	1.6 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			3.9 (Tons, Millions)	0.9 (Tons, Millions)
	DOT	44%	21%	2.5 (Tons, Millions)	1.1 (Tons, Millions)
	Other Agency	37%	11%	1.5 (Tons, Millions)	0.5 (Tons, Millions)
	Commercial & Residential	20%	19%	0.9 (Tons, Millions)	0.9 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	16%	1%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	84%	99%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	33%	33%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	1.7	1.2	4.9	3.9
	DOT	1.0	0.7	2.8	2.4
	Other Agency	0.5	0.2	1.4	0.8
	Commercial & Residential	0.2	0.2	0.7	0.8
	No. of Companies Reporting	5	3		
<b>RAP</b> (Tons, Millions)	Accepted	0.3	0.2	0.9	0.6
	Used in HMA/WMA Mixtures	0.3	0.2	0.9	0.7
	Used as Aggregate	0.0	0.0	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	0.65	0.30	1.83	0.97
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	16.9%	17.3%		
	Average % for Other Agency Mixtures <sup>1</sup>	16.9%	17.3%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	18.8%	19.0%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			17.4%	17.9%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	0%	7%		
	% of RAP Mixtures Using Softer Binders	0%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
<b>RAS</b> (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	0.3	0.0	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	5.0	4.0	14.1	12.9
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.02%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.02%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.02%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.02%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	0%	33%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	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	2%	0%	0.1 (Tons, Millions)	0.0 (Tons, Millions)
	Other Agency	0%	0%	0.0 (Tons, Millions)	0.0 (Tons, Millions)
	Commercial & Residential	4%	0%	0.0 (Tons, Millions)	0.0 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	0%	0%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	100%	0%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	20%	0%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	2.4	2.5	4.0	4.0
	DOT	1.4	1.5	2.4	2.5
	Other Agency	0.5	0.5	0.8	0.7
	Commercial & Residential	0.5	0.5	0.8	0.9
	No. of Companies Reporting	3	3		
<b>RAP</b> (Tons, Millions)	Accepted	1.0	0.8	1.7	1.3
	Used in HMA/WMA Mixtures	0.6	0.7	1.0	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	0.80	0.72	1.31	1.15
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	22.3%	22.7%		
	Average % for Other Agency Mixtures <sup>1</sup>	25.6%	27.0%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	25.0%	27.5%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			24.7%	26.3%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	32%	30%		
	% of RAP Mixtures Using Softer Binders	88%	90%		
	% of RAP Mixtures Using Recycling Agents	4%	2%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	6.0	12.0	9.9	19.4
	Processed Shingles Accepted	1.5	8.0	2.5	12.9
	Used in HMA/WMA Mixtures	2.0	3.5	3.3	5.6
	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	7.4	16.5	12.2	26.6
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.12%	0.30%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.06%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.08%	0.14%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	67%	33%		
	% of RAS Mixtures Using Softer Binders	100%	100%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.3 (Tons, Millions)	2.1 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.9 (Tons, Millions)	0.6 (Tons, Millions)
	DOT	67%	72%	1.6 (Tons, Millions)	1.8 (Tons, Millions)
	Other Agency	56%	77%	0.5 (Tons, Millions)	0.6 (Tons, Millions)
	Commercial & Residential	13%	34%	0.1 (Tons, Millions)	0.3 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	89%	77%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	11%	23%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	67%	67%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	3.6	6.2	7.5	7.0
	DOT	2.0	3.4	4.2	3.8
	Other Agency	0.9	1.3	1.9	1.5
	Commercial & Residential	0.7	1.5	1.4	1.7
	No. of Companies Reporting	7	8		
<b>RAP</b> (Tons, Millions)	Accepted	0.5	1.7	1.1	2.0
	Used in HMA/WMA Mixtures	0.6	1.1	1.3	1.3
	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	0.96	2.86	1.98	3.24
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	15.5%	16.9%		
	Average % for Other Agency Mixtures <sup>1</sup>	17.4%	19.8%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	18.9%	19.3%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			16.7%	17.9%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	34%	58%		
	% of RAP Mixtures Using Softer Binders	3%	6%		
	% of RAP Mixtures Using Recycling Agents	0%	1%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	3.5	0.0	7.2	0.0
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	7.7	0.0	15.9	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	50.4	0.0	104.3	0.0
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.21%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.21%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.21%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.21%	0.00%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	14%	0%		
	% of RAS Mixtures Using Softer Binders	50%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			2.5 (Tons, Millions)	2.9 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.3 (Tons, Millions)	1.4 (Tons, Millions)
	DOT	39%	43%	1.6 (Tons, Millions)	2.3 (Tons, Millions)
	Other Agency	35%	57%	0.6 (Tons, Millions)	0.9 (Tons, Millions)
	Commercial & Residential	43%	65%	0.6 (Tons, Millions)	1.1 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	75%	29%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	25%	71%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	57%	75%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	1.6	*	8.1	7.8
	DOT	0.2	*	0.9	*
	Other Agency	0.8	*	4.0	*
	Commercial & Residential	0.6	*	3.2	*
	No. of Companies Reporting	3	*		
<b>RAP</b> (Tons, Millions)	Accepted	0.4	*	2.0	*
	Used in HMA/WMA Mixtures	0.3	*	1.7	*
	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 RAP Stockpiled at Year-End	0.21	*	1.02	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	20.0%	*		
	Average % for Other Agency Mixtures <sup>1</sup>	21.3%	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	23.3%	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			20.7%	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	*		
	% of RAP Fractionated	50%	*		
	% of RAP Mixtures Using Softer Binders	8%	*		
	% of RAP Mixtures Using Recycling Agents	0%	*		
<b>RAS</b> (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	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	*		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	0%	*		
	% of RAS Mixtures Using Softer Binders	0%	*		
	% of RAS Mixtures Using Recycling Agents	0%	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			6.9 (Tons, Millions)	*
	Total Tons Produced With WMA Technology at HMA Temperatures			0.6 (Tons, Millions)	*
	DOT	94%	*	0.9 (Tons, Millions)	*
	Other Agency	86%	*	3.4 (Tons, Millions)	*
	Commercial & Residential	100%	*	3.2 (Tons, Millions)	*
<b>WMA Technologies</b> (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	100%	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	2.9	1.9	2.9	2.0
	DOT	0.8	0.6	0.8	0.6
	Other Agency	0.7	0.4	0.7	0.4
	Commercial & Residential	1.4	0.9	1.4	1.0
	No. of Companies Reporting	6	3		
<b>RAP</b> (Tons, Millions)	Accepted	0.3	0.2	0.3	0.2
	Used in HMA/WMA Mixtures	0.5	0.3	0.5	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	0.29	0.20	0.29	0.22
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	16.5%	18.6%		
	Average % for Other Agency Mixtures <sup>1</sup>	18.9%	16.6%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	19.3%	19.0%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			18.2%	17.9%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	0%	33%		
	% of RAP Mixtures Using Softer Binders	0%	0%		
	% of RAP Mixtures Using Recycling Agents	5%	33%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	8.2	6.5	8.2	7.0
	Used in HMA/WMA Mixtures	7.9	6.5	7.9	7.0
	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	0.3	0.1	0.3	0.1
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.56%	0.44%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.44%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.27%	0.35%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	67%	33%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	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			1.5 (Tons, Millions)	0.4 (Tons, Millions)
	DOT	56%	44%	0.5 (Tons, Millions)	0.3 (Tons, Millions)
	Other Agency	58%	11%	0.4 (Tons, Millions)	0.0 (Tons, Millions)
	Commercial & Residential	44%	8%	0.6 (Tons, Millions)	0.1 (Tons, Millions)
<b>WMA Technologies</b> (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%	67%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	3.3	2.8	6.6	6.5
	DOT	1.0	1.2	2.1	2.8
	Other Agency	1.1	0.4	2.1	0.9
	Commercial & Residential	1.2	1.2	2.4	2.8
	No. of Companies Reporting	9	6		
<b>RAP</b> (Tons, Millions)	Accepted	1.4	0.9	2.7	2.1
	Used in HMA/WMA Mixtures	0.9	0.8	1.9	1.9
	Used as Aggregate	0.2	0.0	0.3	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	2.27	1.29	4.49	3.00
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	25.9%	26.2%		
	Average % for Other Agency Mixtures <sup>1</sup>	26.5%	22.2%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	32.5%	33.7%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			28.3%	29.4%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	7%	25%		
	% of RAP Mixtures Using Softer Binders	33%	17%		
	% of RAP Mixtures Using Recycling Agents	8%	12%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	10.0	5.0	19.8	11.6
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	10.4	3.6	20.6	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	5.6	20.2	11.1	46.9
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.35%	0.16%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.25%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.35%	0.25%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.31%	0.13%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	22%	33%		
	% of RAS Mixtures Using Softer Binders	80%	50%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.4 <small>(Tons, Millions)</small>	0.2 <small>(Tons, Millions)</small>
	Total Tons Produced With WMA Technology at HMA Temperatures			2.2 <small>(Tons, Millions)</small>	0.1 <small>(Tons, Millions)</small>
	DOT	84%	8%	1.7 <small>(Tons, Millions)</small>	0.2 <small>(Tons, Millions)</small>
	Other Agency	53%	0%	1.1 <small>(Tons, Millions)</small>	0.0 <small>(Tons, Millions)</small>
	Commercial & Residential	32%	3%	0.8 <small>(Tons, Millions)</small>	0.1 <small>(Tons, Millions)</small>
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	15%	0%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	85%	100%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	56%	17%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	1.8	3.5	7.0	7.0
	DOT	0.6	1.0	2.3	2.1
	Other Agency	0.4	1.0	1.7	1.9
	Commercial & Residential	0.8	1.5	3.0	3.0
	No. of Companies Reporting	6	4		
<b>RAP</b> (Tons, Millions)	Accepted	0.4	0.5	1.7	1.0
	Used in HMA/WMA Mixtures	0.3	0.6	1.3	1.2
	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	0.92	3.60	3.67	7.18
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	16.3%	13.8%		
	Average % for Other Agency Mixtures <sup>1</sup>	16.0%	16.0%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	20.2%	21.0%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			18.0%	17.2%
<b>RAP</b> (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%	3%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	10.3	0.0	41.0	0.0
	Processed Shingles Accepted	0.0	1.3	0.0	2.6
	Used in HMA/WMA Mixtures	1.5	1.7	6.0	3.4
	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	12.5	11.2	49.7	22.4
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.14%	0.04%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.14%	0.08%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.09%	0.05%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	17%	50%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	15%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			2.6 <small>(Tons, Millions)</small>	3.6 <small>(Tons, Millions)</small>
	Total Tons Produced With WMA Technology at HMA Temperatures			2.4 <small>(Tons, Millions)</small>	2.4 <small>(Tons, Millions)</small>
	DOT	95%	100%	2.2 <small>(Tons, Millions)</small>	2.1 <small>(Tons, Millions)</small>
	Other Agency	41%	100%	0.7 <small>(Tons, Millions)</small>	1.9 <small>(Tons, Millions)</small>
	Commercial & Residential	70%	65%	2.1 <small>(Tons, Millions)</small>	2.0 <small>(Tons, Millions)</small>
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	42%	92%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	0%		
	Organic Additive, % of Market	58%	8%		
	% Companies Reporting Using WMA Technologies	100%	100%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	8.9	11.8	14.7	15.0
	DOT	3.1	3.3	5.1	4.2
	Other Agency	2.4	4.2	3.9	5.3
	Commercial & Residential	3.4	4.3	5.7	5.4
	No. of Companies Reporting	7	9		
<b>RAP</b> (Tons, Millions)	Accepted	2.5	4.5	4.2	5.7
	Used in HMA/WMA Mixtures	2.4	3.3	3.9	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	2.28	2.32	3.77	2.96
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	22.5%	22.3%		
	Average % for Other Agency Mixtures <sup>1</sup>	23.7%	26.7%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	29.2%	30.4%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			26.8%	27.8%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	28%	26%		
	% of RAP Mixtures Using Softer Binders	22%	23%		
	% of RAP Mixtures Using Recycling Agents	1%	0%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	1.5	1.5	2.5	1.9
	Processed Shingles Accepted	1.0	0.5	1.7	0.6
	Used in HMA/WMA Mixtures	0.5	0.5	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 RAS Stockpiled at Year-End	2.0	1.5	3.3	1.9
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.05%	0.01%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.01%	0.00%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	14%	11%		
	% of RAS Mixtures Using Softer Binders	100%	25%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			0.0 (Tons, Millions)	2.9 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			2.6 (Tons, Millions)	1.2 (Tons, Millions)
	DOT	25%	27%	1.3 (Tons, Millions)	1.1 (Tons, Millions)
	Other Agency	17%	33%	0.7 (Tons, Millions)	1.8 (Tons, Millions)
	Commercial & Residential	11%	22%	0.6 (Tons, Millions)	1.2 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	2%	1%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	98%	99%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	29%	33%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	8.6	9.1	9.2	9.5
	DOT	2.0	1.8	2.2	1.9
	Other Agency	4.2	4.3	4.5	4.5
	Commercial & Residential	2.4	3.0	2.5	3.1
	No. of Companies Reporting	6	6		
<b>RAP</b> (Tons, Millions)	Accepted	2.6	2.7	2.8	2.9
	Used in HMA/WMA Mixtures	1.9	2.1	2.0	2.2
	Used as Aggregate	0.6	0.7	0.7	0.7
	Used in Cold-Mix Asphalt	0.1	0.1	0.1	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	1.88	1.90	2.00	1.99
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	20.5%	21.0%		
	Average % for Other Agency Mixtures <sup>1</sup>	21.8%	21.0%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	23.5%	23.9%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			22.0%	22.7%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	11%	7%		
	% of RAP Mixtures Using Softer Binders	20%	30%		
	% of RAP Mixtures Using Recycling Agents	2%	2%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	7.0	12.0	7.5	12.5
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	18.7	12.0	19.9	12.5
	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	18.5	6.0	19.7	6.3
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.05%	0.13%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.05%	0.13%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.32%	0.13%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.22%	0.13%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	50%	17%		
	% of RAS Mixtures Using Softer Binders	33%	10%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			2.7 (Tons, Millions)	5.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			3.1 (Tons, Millions)	1.4 (Tons, Millions)
	DOT	42%	52%	0.9 (Tons, Millions)	1.0 (Tons, Millions)
	Other Agency	74%	69%	3.3 (Tons, Millions)	3.0 (Tons, Millions)
	Commercial & Residential	63%	76%	1.6 (Tons, Millions)	2.4 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	8%	11%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	92%	89%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	67%	67%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	3.4	3.1	5.4	5.8
	DOT	2.0	2.0	3.2	3.8
	Other Agency	0.8	0.6	1.2	1.0
	Commercial & Residential	0.6	0.5	1.0	1.0
	No. of Companies Reporting	5	3		
<b>RAP</b> (Tons, Millions)	Accepted	0.5	0.3	0.8	0.6
	Used in HMA/WMA Mixtures	0.7	0.6	1.1	1.2
	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	0.46	0.50	0.74	0.93
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	21.0%	19.3%		
	Average % for Other Agency Mixtures <sup>1</sup>	20.8%	20.8%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	18.0%	22.2%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			20.0%	20.1%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	5%	5%		
	% of RAP Mixtures Using Softer Binders	0%	0%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.00%
<b>RAS</b> (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%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			3.4 (Tons, Millions)	2.5 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.8 (Tons, Millions)	1.7 (Tons, Millions)
	DOT	78%	74%	2.5 (Tons, Millions)	2.8 (Tons, Millions)
	Other Agency	93%	81%	1.1 (Tons, Millions)	0.8 (Tons, Millions)
	Commercial & Residential	59%	57%	0.6 (Tons, Millions)	0.6 (Tons, Millions)
<b>WMA Technologies</b> (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	80%	67%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	2.5	3.3	8.0	8.0
	DOT	0.7	1.2	2.4	2.8
	Other Agency	0.4	0.6	1.2	1.5
	Commercial & Residential	1.4	1.5	4.4	3.7
	No. of Companies Reporting	4	5		
<b>RAP</b> (Tons, Millions)	Accepted	0.6	0.8	1.8	1.9
	Used in HMA/WMA Mixtures	0.7	0.9	2.2	2.1
	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	0.46	0.60	1.47	1.44
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	25.6%	26.0%		
	Average % for Other Agency Mixtures <sup>1</sup>	25.6%	24.5%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	29.8%	26.7%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			27.0%	25.9%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	24%	35%		
	% of RAP Mixtures Using Softer Binders	60%	55%		
	% of RAP Mixtures Using Recycling Agents	0%	14%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	5.0	0.0	12.0
	Processed Shingles Accepted	0.6	1.3	2.0	3.1
	Used in HMA/WMA Mixtures	1.1	25.6	3.5	61.3
	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	7.5	30.0	24.0	71.9
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.07%	1.10%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.07%	0.82%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.02%	0.36%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.04%	0.77%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	50%	60%		
	% of RAS Mixtures Using Softer Binders	100%	68%		
	% of RAS Mixtures Using Recycling Agents	0%	34%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.5 (Tons, Millions)	0.8 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.2 (Tons, Millions)	0.7 (Tons, Millions)
	DOT	72%	30%	1.7 (Tons, Millions)	0.8 (Tons, Millions)
	Other Agency	20%	22%	0.2 (Tons, Millions)	0.4 (Tons, Millions)
	Commercial & Residential	17%	9%	0.8 (Tons, Millions)	0.3 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	80%	57%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	20%	43%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	75%	40%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	4.5	4.4
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	3.1	3.0
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	1.6	*	3.7	3.7
	DOT	0.5	*	1.1	*
	Other Agency	0.6	*	1.4	*
	Commercial & Residential	0.5	*	1.2	*
	No. of Companies Reporting	4	*		
<b>RAP</b> (Tons, Millions)	Accepted	0.2	*	0.5	*
	Used in HMA/WMA Mixtures	0.3	*	0.7	*
	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 RAP Stockpiled at Year-End	0.29	*	0.65	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	16.5%	*		
	Average % for Other Agency Mixtures <sup>1</sup>	15.0%	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	24.5%	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			18.8%	*
<b>RAP</b> (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	1%	*		
<b>RAS</b> (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	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	*		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	0%	*		
	% of RAS Mixtures Using Softer Binders	0%	*		
	% of RAS Mixtures Using Recycling Agents	0%	*		
<b>WMA</b>	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	3%	*	0.0 (Tons, Millions)	*
	Commercial & Residential	2%	*	0.0 (Tons, Millions)	*
<b>WMA Technologies</b> (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	25%	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	1.6	*	1.6	1.6
	DOT	0.7	*	0.7	*
	Other Agency	0.3	*	0.3	*
	Commercial & Residential	0.6	*	0.6	*
	No. of Companies Reporting	3	*		
<b>RAP</b> (Tons, Millions)	Accepted	0.2	*	0.3	*
	Used in HMA/WMA Mixtures	0.3	*	0.4	*
	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 RAP Stockpiled at Year-End	0.29	*	0.30	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	22.0%	*		
	Average % for Other Agency Mixtures <sup>1</sup>	22.0%	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	22.7%	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			22.3%	*
<b>RAP</b> (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%	*		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	*	0.0	*
	Processed Shingles Accepted	2.1	*	2.2	*
	Used in HMA/WMA Mixtures	2.1	*	2.2	*
	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	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	*		
	Average % for Other Agency Mixtures <sup>1</sup>	0.08%	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.21%	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.014%	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	33%	*		
	% of RAS Mixtures Using Softer Binders	0%	*		
	% of RAS Mixtures Using Recycling Agents	0%	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			0.0 (Tons, Millions)	*
	Total Tons Produced With WMA Technology at HMA Temperatures			0.3 (Tons, Millions)	*
	DOT	33%	*	0.2 (Tons, Millions)	*
	Other Agency	37%	*	0.1 (Tons, Millions)	*
	Commercial & Residential	8%	*	0.0 (Tons, Millions)	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	50%	*		
	Additive Foaming, % of Market	0%	*		
	Plant Foaming, % of Market	17%	*		
	Organic Additive, % of Market	33%	*		
	% Companies Reporting Using WMA Technologies	100%	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	3.7	3.8	10.5	10.0
	DOT	0.4	0.4	1.2	1.1
	Other Agency	1.9	2.3	5.4	6.1
	Commercial & Residential	1.4	1.0	3.9	2.8
	No. of Companies Reporting	3	3		
<b>RAP</b> (Tons, Millions)	Accepted	1.5	1.6	4.1	4.2
	Used in HMA/WMA Mixtures	0.8	0.8	2.1	2.1
	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	0.1	0.0	0.1
	Total Tons of RAP Stockpiled at Year-End	9.59	10.24	26.89	27.27
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	15.0%	16.8%		
	Average % for Other Agency Mixtures <sup>1</sup>	16.7%	16.5%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	28.3%	30.6%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			20.1%	21.1%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	33%	33%		
	% of RAP Mixtures Using Softer Binders	4%	3%		
	% of RAP Mixtures Using Recycling Agents	30%	31%		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.00%
<b>RAS</b> (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%		
<b>WMA</b>	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			3.7 (Tons, Millions)	3.9 (Tons, Millions)
	DOT	23%	22%	0.3 (Tons, Millions)	0.2 (Tons, Millions)
	Other Agency	64%	60%	3.4 (Tons, Millions)	3.7 (Tons, Millions)
	Commercial & Residential	0%	0%	0.0 (Tons, Millions)	0.0 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	100%	17%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	83%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	33%	33%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	4.0	3.9
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	4.5	5.6	18.5	18.5
	DOT	1.4	1.2	5.9	4.1
	Other Agency	1.9	2.3	7.8	7.5
	Commercial & Residential	1.2	2.1	4.8	6.9
	No. of Companies Reporting	9	9		
<b>RAP</b> (Tons, Millions)	Accepted	0.6	1.5	2.4	5.0
	Used in HMA/WMA Mixtures	0.6	1.1	2.6	3.8
	Used as Aggregate	0.0	0.1	0.0	0.2
	Used in Cold-Mix Asphalt	0.0	0.0	0.0	0.1
	Used in Other	0.0	0.1	0.0	0.4
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	0.65	0.56	2.65	1.87
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	15.2%	18.5%		
	Average % for Other Agency Mixtures <sup>1</sup>	13.8%	23.8%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	14.4%	25.9%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			14.1%	20.3%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	0%	14%		
	% of RAP Mixtures Using Softer Binders	0%	0%		
	% of RAP Mixtures Using Recycling Agents	2%	5%		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.00%
<b>RAS</b> (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%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.7 <small>(Tons, Millions)</small>	3.9 <small>(Tons, Millions)</small>
	Total Tons Produced With WMA Technology at HMA Temperatures			2.1 <small>(Tons, Millions)</small>	0.5 <small>(Tons, Millions)</small>
	DOT	37%	86%	2.2 <small>(Tons, Millions)</small>	3.5 <small>(Tons, Millions)</small>
	Other Agency	10%	9%	0.8 <small>(Tons, Millions)</small>	0.7 <small>(Tons, Millions)</small>
	Commercial & Residential	17%	3%	0.8 <small>(Tons, Millions)</small>	0.2 <small>(Tons, Millions)</small>
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	74%	56%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	26%	39%		
	Organic Additive, % of Market	0%	5%		
	% Companies Reporting Using WMA Technologies	78%	78%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	9.7	12.4	14.0	13.0
	DOT	6.7	8.0	9.7	8.3
	Other Agency	0.7	1.4	1.0	1.5
	Commercial & Residential	2.3	3.0	3.3	3.2
	No. of Companies Reporting	9	10		
<b>RAP</b> (Tons, Millions)	Accepted	2.6	3.3	3.8	3.5
	Used in HMA/WMA Mixtures	3.0	3.0	4.4	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 RAP Stockpiled at Year-End	4.39	4.85	6.35	5.07
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	31.8%	27.8%		
	Average % for Other Agency Mixtures <sup>1</sup>	28.3%	22.2%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	31.8%	25.4%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			31.3%	24.0%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	27%	26%		
	% of RAP Mixtures Using Softer Binders	32%	32%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	60.0	50.0	86.8	52.3
	Processed Shingles Accepted	21.5	36.2	31.1	37.9
	Used in HMA/WMA Mixtures	10.1	38.7	14.6	40.5
	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	173.5	190.6	251.0	199.3
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.16%	0.41%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.07%	0.19%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.12%	0.36%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.10%	0.31%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	44%	50%		
	% of RAS Mixtures Using Softer Binders	88%	80%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.2 (Tons, Millions)	2.4 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.6 (Tons, Millions)	4.1 (Tons, Millions)
	DOT	28%	67%	2.8 (Tons, Millions)	5.6 (Tons, Millions)
	Other Agency	0%	25%	0.0 (Tons, Millions)	0.4 (Tons, Millions)
	Commercial & Residential	1%	16%	0.0 (Tons, Millions)	0.5 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	100%	71%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	0%		
	Organic Additive, % of Market	0%	29%		
	% Companies Reporting Using WMA Technologies	44%	50%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	2.6	2.6
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (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		
<b>RAP</b> (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
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Other Agency Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	NCR	NCR		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			NCR	NCR
<b>RAP</b> (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		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Other Agency Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	NCR	NCR		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			NCR	NCR
<b>RAS</b> (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		
<b>WMA</b>	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
<b>WMA Technologies</b> (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		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	13.2	10.2	14.8	18.0
	DOT	4.3	2.7	4.8	4.7
	Other Agency	4.5	3.9	5.0	7.0
	Commercial & Residential	4.4	3.6	5.0	6.3
	No. of Companies Reporting	9	12		
<b>RAP</b> (Tons, Millions)	Accepted	4.1	2.8	4.6	4.9
	Used in HMA/WMA Mixtures	3.6	2.8	4.0	5.0
	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	0.0	0.0
	Landfilled	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	3.09	4.35	3.46	7.67
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	27.2%	24.2%		
	Average % for Other Agency Mixtures <sup>1</sup>	25.3%	27.1%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	28.1%	29.5%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			27.1%	27.9%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	20%	19%		
	% of RAP Mixtures Using Softer Binders	30%	38%		
	% of RAP Mixtures Using Recycling Agents	3%	10%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	5.0	0.0	8.8
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	2.8	7.6	3.1	13.4
	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	24.0	70.0	26.9	123.5
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.01%	0.09%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.03%	0.09%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.02%	0.07%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	22%	17%		
	% of RAS Mixtures Using Softer Binders	100%	100%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			6.4 (Tons, Millions)	2.7 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			3.3 (Tons, Millions)	1.9 (Tons, Millions)
	DOT	74%	31%	3.5 (Tons, Millions)	1.5 (Tons, Millions)
	Other Agency	55%	23%	2.8 (Tons, Millions)	1.6 (Tons, Millions)
	Commercial & Residential	68%	23%	3.4 (Tons, Millions)	1.5 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	2%	26%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	98%	74%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	89%	42%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	5.1	3.5	5.1	5.2
	DOT	2.8	1.4	2.8	2.0
	Other Agency	1.2	1.0	1.2	1.5
	Commercial & Residential	1.1	1.1	1.1	1.7
	No. of Companies Reporting	10	7		
<b>RAP</b> (Tons, Millions)	Accepted	0.8	0.7	0.8	1.0
	Used in HMA/WMA Mixtures	1.0	0.6	1.0	0.9
	Used as Aggregate	0.0	0.0	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	1.21	0.85	1.21	1.28
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	15.9%	16.2%		
	Average % for Other Agency Mixtures <sup>1</sup>	19.4%	16.2%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	22.2%	20.9%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			19.2%	17.1%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	44%	43%		
	% of RAP Mixtures Using Softer Binders	16%	16%		
	% of RAP Mixtures Using Recycling Agents	10%	1%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	1.0	3.0	1.0	4.5
	Processed Shingles Accepted	10.0	0.0	10.0	0.0
	Used in HMA/WMA Mixtures	21.0	4.6	21.0	6.9
	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	22.2	0.3	22.2	0.4
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.50%	0.13%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.93%	0.28%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.41%	0.13%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	30%	14%		
	% of RAS Mixtures Using Softer Binders	75%	100%		
	% of RAS Mixtures Using Recycling Agents	50%	100%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.3 (Tons, Millions)	1.7 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.8 (Tons, Millions)	1.0 (Tons, Millions)
	DOT	42%	64%	1.2 (Tons, Millions)	1.3 (Tons, Millions)
	Other Agency	46%	68%	0.6 (Tons, Millions)	1.0 (Tons, Millions)
	Commercial & Residential	29%	22%	0.3 (Tons, Millions)	0.4 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	7%	40%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	93%	60%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	50%	57%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	1.8	2.9	5.5	5.4
	DOT	0.2	0.6	0.7	1.1
	Other Agency	0.7	1.0	2.0	1.8
	Commercial & Residential	0.9	1.3	2.8	2.5
	No. of Companies Reporting	4	4		
<b>RAP</b> (Tons, Millions)	Accepted	0.4	0.8	1.2	1.6
	Used in HMA/WMA Mixtures	0.5	0.7	1.6	1.4
	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	0.69	1.24	2.05	2.33
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	27.5%	24.3%		
	Average % for Other Agency Mixtures <sup>1</sup>	27.5%	25.7%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	29.5%	27.0%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			28.6%	25.6%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	1%	0%		
	% of RAP Mixtures Using Softer Binders	6%	1%		
	% of RAP Mixtures Using Recycling Agents	0%	0%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.5	0.0	1.5	0.0
	Used in HMA/WMA Mixtures	1.0	0.1	3.0	0.2
	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	9.1	34.1	27.2	64.2
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.04%	0.01%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.04%	0.01%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.07%	0.01%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.05%	0.01%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	50%	25%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	10%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			0.6 <small>(Tons, Millions)</small>	1.3 <small>(Tons, Millions)</small>
	Total Tons Produced With WMA Technology at HMA Temperatures			1.8 <small>(Tons, Millions)</small>	3.3 <small>(Tons, Millions)</small>
	DOT	38%	100%	0.3 <small>(Tons, Millions)</small>	1.1 <small>(Tons, Millions)</small>
	Other Agency	44%	86%	0.9 <small>(Tons, Millions)</small>	1.6 <small>(Tons, Millions)</small>
	Commercial & Residential	44%	74%	1.2 <small>(Tons, Millions)</small>	1.9 <small>(Tons, Millions)</small>
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	29%	17%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	71%	83%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	75%	100%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	5.7	7.3	20.0	21.5
	DOT	2.9	3.4	10.2	10.0
	Other Agency	1.0	1.8	3.5	5.4
	Commercial & Residential	1.8	2.1	6.3	6.1
	No. of Companies Reporting	8	8		
<b>RAP</b> (Tons, Millions)	Accepted	1.2	1.3	4.1	3.8
	Used in HMA/WMA Mixtures	1.2	1.4	4.2	4.0
	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	0.88	1.78	3.09	5.29
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	18.6%	18.6%		
	Average % for Other Agency Mixtures <sup>1</sup>	18.9%	17.8%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	22.4%	19.0%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			20.9%	18.7%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	28%	3%		
	% of RAP Mixtures Using Softer Binders	11%	8%		
	% of RAP Mixtures Using Recycling Agents	6%	5%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	8.0	35.0	28.1	103.8
	Processed Shingles Accepted	2.7	0.0	9.5	0.0
	Used in HMA/WMA Mixtures	16.7	42.4	58.7	125.7
	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	5.0	70.2	17.6	208.2
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.24%	0.51%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.21%	0.51%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.47%	0.70%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.29%	0.58%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	38%	13%		
	% of RAS Mixtures Using Softer Binders	25%	0%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			9.9 (Tons, Millions)	8.6 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			8.2 (Tons, Millions)	9.1 (Tons, Millions)
	DOT	100%	88%	10.2 (Tons, Millions)	8.8 (Tons, Millions)
	Other Agency	94%	70%	3.3 (Tons, Millions)	3.8 (Tons, Millions)
	Commercial & Residential	73%	83%	4.6 (Tons, Millions)	5.1 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	76%	75%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	24%	25%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	88%	100%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (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		
<b>RAP</b> (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
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Other Agency Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	NCR	NCR		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			NCR	NCR
<b>RAP</b> (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		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Other Agency Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	NCR	NCR		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			NCR	NCR
<b>RAS</b> (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		
<b>WMA</b>	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
<b>WMA Technologies</b> (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		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	2.2	2.2
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	7.1	5.0	7.1	7.4
	DOT	3.8	2.7	3.8	4.0
	Other Agency	0.9	0.9	0.9	1.3
	Commercial & Residential	2.4	1.4	2.4	2.1
	No. of Companies Reporting	10	8		
<b>RAP</b> (Tons, Millions)	Accepted	1.6	1.5	1.6	2.2
	Used in HMA/WMA Mixtures	1.9	1.2	1.9	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	1.68	0.77	1.68	1.15
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	25.4%	23.6%		
	Average % for Other Agency Mixtures <sup>1</sup>	24.2%	20.0%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	29.5%	25.8%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			26.7%	23.8%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	63%	56%		
	% of RAP Mixtures Using Softer Binders	10%	0%		
	% of RAP Mixtures Using Recycling Agents	2%	0%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	16.0	15.5	16.0	23.1
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	3.2	5.0	3.2	7.5
	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	24.5	22.0	24.5	32.9
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.07%	0.10%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.03%	0.10%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.03%	0.10%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.05%	0.10%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	20%	25%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	10%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			0.5 <small>(Tons, Millions)</small>	0.6 <small>(Tons, Millions)</small>
	Total Tons Produced With WMA Technology at HMA Temperatures			0.3 <small>(Tons, Millions)</small>	1.6 <small>(Tons, Millions)</small>
	DOT	13%	32%	0.5 <small>(Tons, Millions)</small>	1.3 <small>(Tons, Millions)</small>
	Other Agency	17%	44%	0.2 <small>(Tons, Millions)</small>	0.6 <small>(Tons, Millions)</small>
	Commercial & Residential	3%	13%	0.1 <small>(Tons, Millions)</small>	0.3 <small>(Tons, Millions)</small>
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	100%	99%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	0%	1%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	70%	100%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	3.0	2.9
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	6.1	3.5	9.5	9.2
	DOT	3.0	1.3	4.7	3.4
	Other Agency	1.8	0.9	2.7	2.4
	Commercial & Residential	1.3	1.3	2.1	3.4
	No. of Companies Reporting	9	8		
<b>RAP</b> (Tons, Millions)	Accepted	1.3	0.9	2.0	2.3
	Used in HMA/WMA Mixtures	1.2	0.8	1.9	2.0
	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	1.67	1.97	2.59	5.19
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	18.5%	19.6%		
	Average % for Other Agency Mixtures <sup>1</sup>	19.9%	22.8%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	24.5%	24.6%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			20.4%	22.3%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	63%	63%		
	% of RAP Mixtures Using Softer Binders	17%	1%		
	% of RAP Mixtures Using Recycling Agents	11%	16%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	0.6	3.6	0.9	9.5
	Processed Shingles Accepted	0.0	10.9	0.0	28.7
	Used in HMA/WMA Mixtures	8.5	11.1	13.2	29.2
	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	2.6	5.6	4.0	14.7
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.22%	0.61%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.04%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.04%	0.74%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.14%	0.32%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	22%	25%		
	% of RAS Mixtures Using Softer Binders	0%	0%		
	% of RAS Mixtures Using Recycling Agents	45%	50%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			0.5 (Tons, Millions)	0.9 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			0.9 (Tons, Millions)	3.3 (Tons, Millions)
	DOT	16%	48%	0.7 (Tons, Millions)	1.6 (Tons, Millions)
	Other Agency	15%	43%	0.5 (Tons, Millions)	1.0 (Tons, Millions)
	Commercial & Residential	11%	45%	0.2 (Tons, Millions)	1.5 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	42%	70%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	58%	30%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	33%	100%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	8.7	8.3	44.7	52.5
	DOT	3.9	3.3	20.0	20.8
	Other Agency	2.3	2.5	11.8	15.6
	Commercial & Residential	2.5	2.5	12.9	16.0
	No. of Companies Reporting	6	4		
<b>RAP</b> (Tons, Millions)	Accepted	1.5	1.8	7.8	11.3
	Used in HMA/WMA Mixtures	1.5	1.7	7.8	10.5
	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	2.14	1.51	11.00	9.56
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	16.0%	15.0%		
	Average % for Other Agency Mixtures <sup>1</sup>	16.3%	17.2%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	19.8%	24.2%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			17.5%	20.0%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	60%	34%		
	% of RAP Mixtures Using Softer Binders	40%	8%		
	% of RAP Mixtures Using Recycling Agents	0%	1%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	5.3	0.0	27.2	0.0
	Processed Shingles Accepted	3.8	6.5	19.5	41.2
	Used in HMA/WMA Mixtures	12.5	16.7	64.2	105.8
	Used as Aggregate	1.3	0.0	6.7	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	39.9	4.1	205.0	26.0	
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.19%	0.20%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.11%	0.20%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.15%	0.20%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.14%	0.20%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	67%	75%		
	% of RAS Mixtures Using Softer Binders	25%	36%		
	% of RAS Mixtures Using Recycling Agents	0%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			7.4 (Tons, Millions)	13.5 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			15.6 (Tons, Millions)	7.2 (Tons, Millions)
	DOT	57%	50%	11.4 (Tons, Millions)	10.4 (Tons, Millions)
	Other Agency	43%	35%	5.1 (Tons, Millions)	5.5 (Tons, Millions)
	Commercial & Residential	50%	30%	6.5 (Tons, Millions)	4.8 (Tons, Millions)
<b>WMA Technologies</b> (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%	75%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (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		
<b>RAP</b> (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
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Other Agency Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	NCR	NCR		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			NCR	NCR
<b>RAP</b> (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		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Other Agency Mixtures <sup>1</sup>	NCR	NCR		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	NCR	NCR		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			NCR	NCR
<b>RAS</b> (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		
<b>WMA</b>	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
<b>WMA Technologies</b> (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		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	2.8	1.9	3.7	4.2
	DOT	0.9	0.6	1.2	1.3
	Other Agency	0.9	0.6	1.1	1.3
	Commercial & Residential	1.0	0.7	1.4	1.6
	No. of Companies Reporting	7	6		
<b>RAP</b> (Tons, Millions)	Accepted	0.6	0.5	0.8	1.0
	Used in HMA/WMA Mixtures	0.8	0.4	1.1	1.0
	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	1.08	1.01	1.45	2.20
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	25.0%	20.9%		
	Average % for Other Agency Mixtures <sup>1</sup>	25.3%	20.8%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	32.1%	24.8%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			28.7%	22.7%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	15%	6%		
	% of RAP Mixtures Using Softer Binders	63%	35%		
	% of RAP Mixtures Using Recycling Agents	20%	13%		
<b>RAS</b> (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	
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.00%
<b>RAS</b> (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%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.5 (Tons, Millions)	0.6 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.1 (Tons, Millions)	1.1 (Tons, Millions)
	DOT	75%	48%	0.9 (Tons, Millions)	0.6 (Tons, Millions)
	Other Agency	64%	41%	0.7 (Tons, Millions)	0.6 (Tons, Millions)
	Commercial & Residential	74%	32%	1.0 (Tons, Millions)	0.5 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	36%	91%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	64%	9%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	71%	83%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	2.0	2.0
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	6.6	6.7	11.5	12.0
	DOT	2.7	2.8	4.8	5.1
	Other Agency	1.5	1.6	2.5	2.8
	Commercial & Residential	2.4	2.3	4.2	4.1
	No. of Companies Reporting	10	12		
<b>RAP</b> (Tons, Millions)	Accepted	2.4	2.4	4.2	4.4
	Used in HMA/WMA Mixtures	2.0	2.0	3.5	3.5
	Used as Aggregate	0.0	0.1	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	0.0	0.0	0.0	0.0
	Total Tons of RAP Stockpiled at Year-End	2.37	2.44	4.15	4.33
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	29.9%	27.8%		
	Average % for Other Agency Mixtures <sup>1</sup>	28.1%	27.8%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	32.4%	31.3%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			30.6%	29.0%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	29%	43%		
	% of RAP Mixtures Using Softer Binders	22%	9%		
	% of RAP Mixtures Using Recycling Agents	1%	5%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	0.0	0.0	0.0	0.0
	Processed Shingles Accepted	0.0	4.0	0.0	7.1
	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	5.0	4.0	8.8	7.1
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.00%
<b>RAS</b> (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%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			7.5 (Tons, Millions)	6.0 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			3.1 (Tons, Millions)	2.0 (Tons, Millions)
	DOT	87%	68%	4.2 (Tons, Millions)	3.4 (Tons, Millions)
	Other Agency	95%	72%	2.4 (Tons, Millions)	2.0 (Tons, Millions)
	Commercial & Residential	95%	62%	4.0 (Tons, Millions)	2.6 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	89%	88%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	11%	12%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	80%	83%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	4.6	3.2	6.2	6.1
	DOT	0.5	0.5	0.7	0.9
	Other Agency	1.7	1.1	2.3	2.1
	Commercial & Residential	2.4	1.6	3.2	3.1
	No. of Companies Reporting	7	6		
<b>RAP</b> (Tons, Millions)	Accepted	1.1	0.7	1.4	1.3
	Used in HMA/WMA Mixtures	1.1	0.7	1.4	1.4
	Used as Aggregate	0.1	0.1	0.2	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	0.1
	Total Tons of RAP Stockpiled at Year-End	0.73	0.44	0.98	0.84
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	21.5%	20.8%		
	Average % for Other Agency Mixtures <sup>1</sup>	20.6%	20.8%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	25.6%	26.2%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			23.3%	23.4%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	27%	22%		
	% of RAP Mixtures Using Softer Binders	25%	32%		
	% of RAP Mixtures Using Recycling Agents	3%	3%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	14.3	35.5	19.1	68.1
	Processed Shingles Accepted	0.0	0.0	0.0	0.0
	Used in HMA/WMA Mixtures	10.5	24.4	14.0	46.8
	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	6.5	12.1	8.7	23.2
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.15%	0.57%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.20%	0.57%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.38%	0.99%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.23%	0.77%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	43%	33%		
	% of RAS Mixtures Using Softer Binders	73%	50%		
	% of RAS Mixtures Using Recycling Agents	11%	0%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.3 (Tons, Millions)	0.9 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.8 (Tons, Millions)	1.0 (Tons, Millions)
	DOT	29%	41%	0.2 (Tons, Millions)	0.4 (Tons, Millions)
	Other Agency	34%	27%	0.8 (Tons, Millions)	0.6 (Tons, Millions)
	Commercial & Residential	41%	33%	1.3 (Tons, Millions)	1.0 (Tons, Millions)
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	10%	0%		
	Additive Foaming, % of Market	0%	0%		
	Plant Foaming, % of Market	90%	100%		
	Organic Additive, % of Market	0%	0%		
	% Companies Reporting Using WMA Technologies	71%	67%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	2.1	1.9	3.8	3.6
	DOT	1.8	1.4	3.3	2.7
	Other Agency	0.0	0.2	0.0	0.3
	Commercial & Residential	0.3	0.3	0.5	0.5
	No. of Companies Reporting	3	3		
<b>RAP</b> (Tons, Millions)	Accepted	0.3	0.3	0.5	0.6
	Used in HMA/WMA Mixtures	0.3	0.3	0.6	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	0.36	0.44	0.65	0.83
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	16.5%	14.1%		
	Average % for Other Agency Mixtures <sup>1</sup>	8.0%	13.0%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	16.6%	14.1%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			16.2%	13.7%
<b>RAP</b> (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%		
<b>RAS</b> (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
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.00%	0.00%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.00%	0.00%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.00%	0.00%
<b>RAS</b> (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%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			0.1 <small>(Tons, Millions)</small>	0.0 <small>(Tons, Millions)</small>
	Total Tons Produced With WMA Technology at HMA Temperatures			0.1 <small>(Tons, Millions)</small>	0.2 <small>(Tons, Millions)</small>
	DOT	6%	6%	0.2 <small>(Tons, Millions)</small>	0.2 <small>(Tons, Millions)</small>
	Other Agency	40%	1%	0.0 <small>(Tons, Millions)</small>	0.0 <small>(Tons, Millions)</small>
	Commercial & Residential	6%	5%	0.0 <small>(Tons, Millions)</small>	0.0 <small>(Tons, Millions)</small>
<b>WMA Technologies</b> (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	33%	33%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	8.8	9.5	13.0	11.5
	DOT	5.0	4.3	7.4	5.3
	Other Agency	1.5	2.2	2.3	2.6
	Commercial & Residential	2.3	3.0	3.3	3.6
	No. of Companies Reporting	3	4		
<b>RAP</b> (Tons, Millions)	Accepted	2.0	2.3	2.9	2.8
	Used in HMA/WMA Mixtures	1.8	1.9	2.7	2.4
	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	2.70	2.18	4.00	2.65
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	20.0%	19.8%		
	Average % for Other Agency Mixtures <sup>1</sup>	20.0%	20.1%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	23.6%	21.7%		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			21.0%	20.5%
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	100%	100%		
	% of RAP Fractionated	5%	6%		
	% of RAP Mixtures Using Softer Binders	20%	21%		
	% of RAP Mixtures Using Recycling Agents	1%	1%		
<b>RAS</b> (Tons, Thousands)	Unprocessed Shingles Accepted	27.5	83.4	40.8	101.3
	Processed Shingles Accepted	30.0	31.5	44.5	38.3
	Used in HMA/WMA Mixtures	35.5	44.3	52.6	53.8
	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	46.5	98.7	68.9	119.9
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	0.38%	0.47%		
	Average % for Other Agency Mixtures <sup>1</sup>	0.35%	0.47%		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	0.49%	0.47%		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			0.40%	0.47%
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	100%	100%		
	% of RAS Mixtures Using Softer Binders	100%	30%		
	% of RAS Mixtures Using Recycling Agents	9%	3%		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			1.1 (Tons, Millions)	5.6 (Tons, Millions)
	Total Tons Produced With WMA Technology at HMA Temperatures			1.6 (Tons, Millions)	0.3 (Tons, Millions)
	DOT	28%	54%	2.1 (Tons, Millions)	2.8 (Tons, Millions)
	Other Agency	16%	55%	0.4 (Tons, Millions)	1.5 (Tons, Millions)
	Commercial & Residential	5%	47%	0.2 (Tons, Millions)	1.7 (Tons, Millions)
<b>WMA Technologies</b> (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%		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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	
		2021	2022	2021	2022
<b>HMA/WMA</b> (Tons, Millions)	Total	*	*	2.7	2.6
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
	No. of Companies Reporting	*	*		
<b>RAP</b> (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	*	*	*	*
<b>RAP</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAP Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAP</b> (Other Reported Data)	% Companies Reporting Using RAP	*	*		
	% of RAP Fractionated	*	*		
	% of RAP Mixtures Using Softer Binders	*	*		
	% of RAP Mixtures Using Recycling Agents	*	*		
<b>RAS</b> (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	*	*	*	*
<b>RAS</b> (Average % Used in Mixtures)	Average % for DOT Mixtures <sup>1</sup>	*	*		
	Average % for Other Agency Mixtures <sup>1</sup>	*	*		
	Average % for Commercial & Residential Mixtures <sup>1</sup>	*	*		
	State Average All Mixtures Based on RAS Tons Used in HMA/WMA <sup>2</sup>			*	*
<b>RAS</b> (Other Reported Data)	% Companies Reporting Using RAS	*	*		
	% of RAS Mixtures Using Softer Binders	*	*		
	% of RAS Mixtures Using Recycling Agents	*	*		
<b>WMA</b>	Total Tons Produced With WMA Technology at Reduced Temperature			*	*
	Total Tons Produced With WMA Technology at HMA Temperatures			*	*
	DOT	*	*	*	*
	Other Agency	*	*	*	*
	Commercial & Residential	*	*	*	*
<b>WMA Technologies</b> (Other Reported Data)	Chemical Additive, % of Market	*	*		
	Additive Foaming, % of Market	*	*		
	Plant Foaming, % of Market	*	*		
	Organic Additive, % of Market	*	*		
	% Companies Reporting Using WMA Technologies	*	*		

<sup>1</sup> Average percent based on contractor's reported percentage for each sector, adjusted based upon reported tonnage.

<sup>2</sup> 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





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## **13<sup>th</sup> Annual Asphalt Pavement Industry Survey IS 138 — Appendix B**





# Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage 2022

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

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13th Annual Survey

# Asphalt Pavement Industry Survey on Recycled Materials and Warm-Mix Asphalt Usage: 2022

## Appendix C

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### 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*

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. Based on these assumptions, the weighted average temperature reduction achieved among asphalt mix produced at reduced temperature (103.9 million tons) was 25.9°F. The weighted average temperature reduction achieved among all asphalt mix produced in 2022 (441.9 million tons) was 6.1°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 2.7 trillion Btu (Equation 1).

$$103.9 \text{ million tons} \times 25.9 \text{ }^\circ\text{F} \times \frac{1,000 \text{ Btu}}{^\circ\text{F} \cdot \text{ton}} = 2.7 \text{ trillion Btu} \quad (1)$$

It should be noted that this estimate only accounts for reduced burner fuel combustion and does not account for other efficiencies that may be achieved by producing mix at reduced temperatures.

#### *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 (2.7 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, 0.189 million metric tonne (MMT) CO<sub>2</sub>e, is the sum of the avoided emissions associated with each fuel type.



A sample calculation for residual fuel oil is provided below.

$$\begin{aligned}
 & \text{Avoided Emissions}_{\text{residual fuel oil}} \\
 &= 2.7 \text{ trillion Btu} \times 1.7\% \times \frac{10^6 \text{ MMBtu}}{\text{trillion Btu}} \times \frac{1 \text{ gal}}{0.150 \text{ MMBtu}} \times \frac{14.45669 \text{ kg CO}_2\text{e}}{\text{gal}} \times \frac{1 \text{ MMT}}{10^9 \text{ kg}} \\
 &= 0.004 \text{ MMT CO}_2\text{e}
 \end{aligned}$$

**Table C1: Distribution of Fuels Consumed by Asphalt Plants, Conversion Factors, and Emission Factors<sup>1</sup>**

Fuel Type	Percentage of Fuel Consumed by Asphalt Plants	Energy Conversion Factor <sup>2</sup>	Cradle-to-Combusted GWP-100 Emission Factor (kg CO <sub>2</sub> e/unit volume) <sup>3</sup>
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 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 37,200 tons of water are consumed to produce WMA at reduced temperature. This can be converted to 8.9 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<sub>2</sub>e/MG water. Industrial and mining water supplies have carbon intensities of 0.33 and 0.25 tonne CO<sub>2</sub>e/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<sub>2</sub>e/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.

Currently, there are three WMA additives for which the carbon footprint is publicly available, Ingevity's Evotherm M1 and P25 products, and Cargill's Anova 1501 WMA additive (Ingevity 2022 and 2023, Cargill 2023a). The upstream carbon footprints for these three products are 2,404, -118, and -888 kg CO<sub>2e</sub>/ton. Some of these values are negative because they account for the biogenic carbon content of the WMA additive. A conversion factor of 44/12 was used to convert biogenic carbon content of the WMA additive to CO<sub>2e</sub> (U.S. EPA, 2011). For this analysis, we use the geometric mean value of the available WMA additive data, 466 kg CO<sub>2e</sub>/ton of WMA additive. 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 by weight of binder per Ingevity (no date) and FHWA (2023), 16,208 tons of WMA additive was consumed to reduce mix production temperatures. Using Ingevity's published value of 466 kg CO<sub>2e</sub>/ton of WMA additive, the upstream GHG emissions would be 0.007 MMT CO<sub>2e</sub>. Subtracting this number from the 0.189 MMT of avoided emissions results in a net emissions reduction of 0.18 MMT CO<sub>2e</sub>.

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 0.8% 1.0%, respectively, of mix produced at reduced temperatures in 2022. 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.

A detailed discussion of the calculation methodology is provided below.

### ***GHG Emission Reduction from Avoided Use of Asphalt Binder***

Starting with an estimated 98.1 million tons of RAP utilized in asphalt mixtures, approximately 4.91 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<sub>2</sub>e/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 2.83 million tonne CO<sub>2</sub>e.

### ***GHG Emissions Reduction from Avoided Use of Aggregates***

Starting with an estimated 98.1 million tons of RAP utilized in asphalt mixtures, approximately 93.19 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<sub>2</sub>e/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<sub>2</sub>e.

### ***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 (Mukherjee, 2016). Using the total RAP quantity of 98.1 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<sub>2</sub>e /ton-mile, consistent with Shacat et al. (2022) and references therein. This emission factor is multiplied by the estimate of 2.49 billion ton-miles of avoided transport to yield a GHG emission reduction of approximately 0.46 million tonne CO<sub>2</sub>e.

### ***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 9.81 million gallons of distillate fuel oil are consumed to process 98.1 million tons of RAP. Using an emission factor of 12.25 kg CO<sub>2</sub>e per gallon of distillate fuel oil (Shacat et al., 2022), GHG emissions from RAP processing are estimated to be approximately 0.12 MMT CO<sub>2</sub>e. 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 98.1 million tons to yield 3.24 billion ton-miles. Using the emission factor of 0.185465 kg CO<sub>2</sub>e/ton-mile, GHG emissions for transporting RAP to the plant are estimated to be approximately 0.60 million tonne CO<sub>2</sub>e.

## 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 18% of RAP mixes used a softer binder and 7% of RAP mixes used a recycling agent in 2022 (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. 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 a separate values for different PG grades. Thus, GHG emission burdens from use of softer binders and recycling agents are not estimated in this report.

Specific data regarding the types and quantities of recycling agents used are not collected in the survey. Since upstream data for only one recycling agent is publicly available (Cargill 2023b), we conducted a sensitivity analysis to determine the potential GHG emissions burden associated with manufacturing recycling agents. The sensitivity analysis uses a hypothetical scenario in which all of the recycling agents used in the U.S. have the same carbon footprint and are dosed at the same rate.

For this analysis, we assumed that 30,933 tons of mix were produced using recycling agents (7% of the 441.9 million tons of mix produced in 2022, per Table 8). This is likely an overestimate, since the survey does not provide separate data regarding the tonnage of mix produced with and without RAP. Assuming an average dosage rate of 1.6% by weight of total binder for triglyceride/fatty acid rejuvenators per Kim et al. (2019) (equal to 0.08% by weight of total mix, assuming a 5% total binder content), approximately 24,746 tons of recycling agent would have been consumed in 2022. The available data indicates that the carbon footprint of manufacturing this type of recycling agent is -839 kg CO<sub>2</sub>e/ton of recycling agent (Cargill 2023b). This value is negative because it accounts for the biogenic carbon content of the recycling agent, which is a biobased product. A conversion factor of 44/12 was used to convert biogenic carbon content of the recycling agent to CO<sub>2</sub>e (U.S. EPA, 2011). Multiplying 24,746 tons of recycling agent by -839 kg CO<sub>2</sub>e/ton yields 20,762 metric tonne CO<sub>2</sub>e removal. If this value were incorporated into the calculation of emissions reduction associated with use of RAP, the total would change from 2.7 to 2.8 MMT CO<sub>2</sub>e of emissions reduction.

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