California Waste Tire Market Report: 2019

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Acknowledgments

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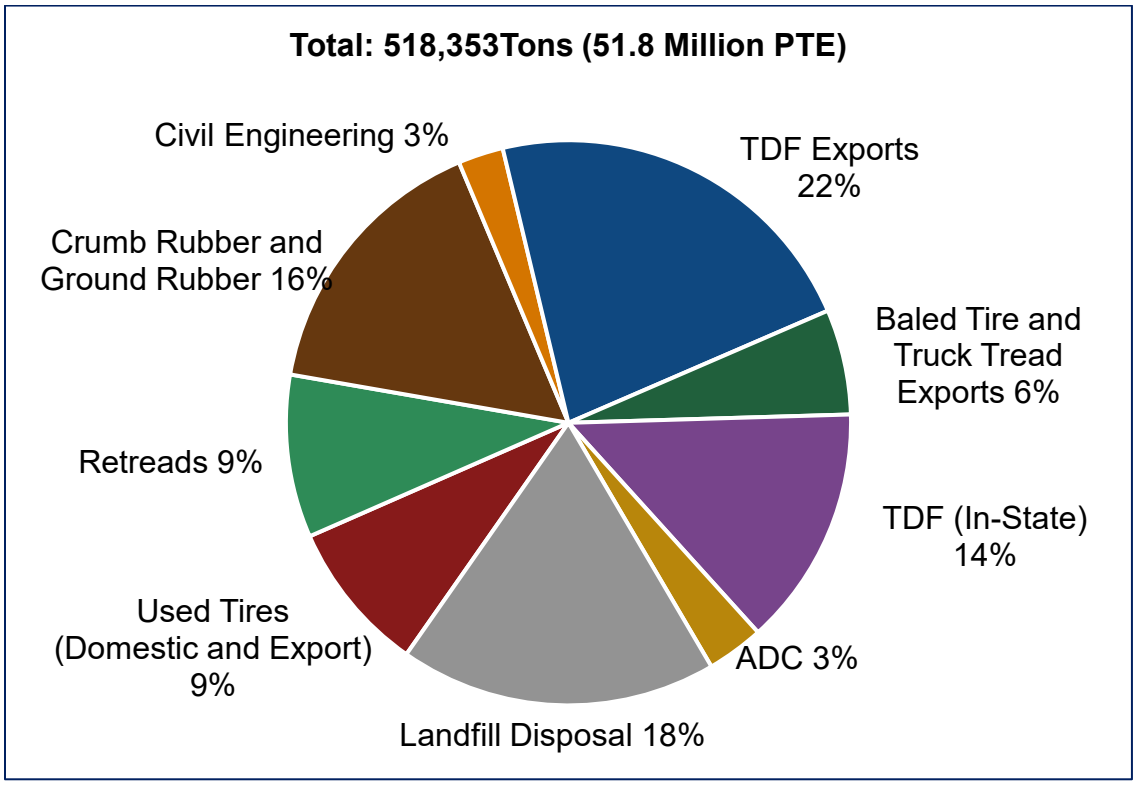
We wish to sincerely thank all of the many industry stakeholders who took the time to contribute information, data and perspectives, especially during the unprecedented COVID-19 pandemic that was severely disrupting normal life and commerce as we conducted research for this report.

Executive Summary

This report describes California waste tire flows in 2019 and current trends as of spring 2020. The estimated flows are based on detailed analysis of information from California waste tire management companies, CalRecycle databases, and other sources. Notwithstanding data gaps and inconsistencies, the authors believe this report, along with previous annual versions, provides reasonably accurate information that can be used to evaluate California's waste tire market trends over time.

In 2019, an estimated 518,400 tons (51.8 million PTEs*) of California-generated waste tires were managed, slightly more than in 2018. California waste tires flowed to nine different market segments as shown in Figure 1.

Figure 1
California Waste Tire Flows in 2019

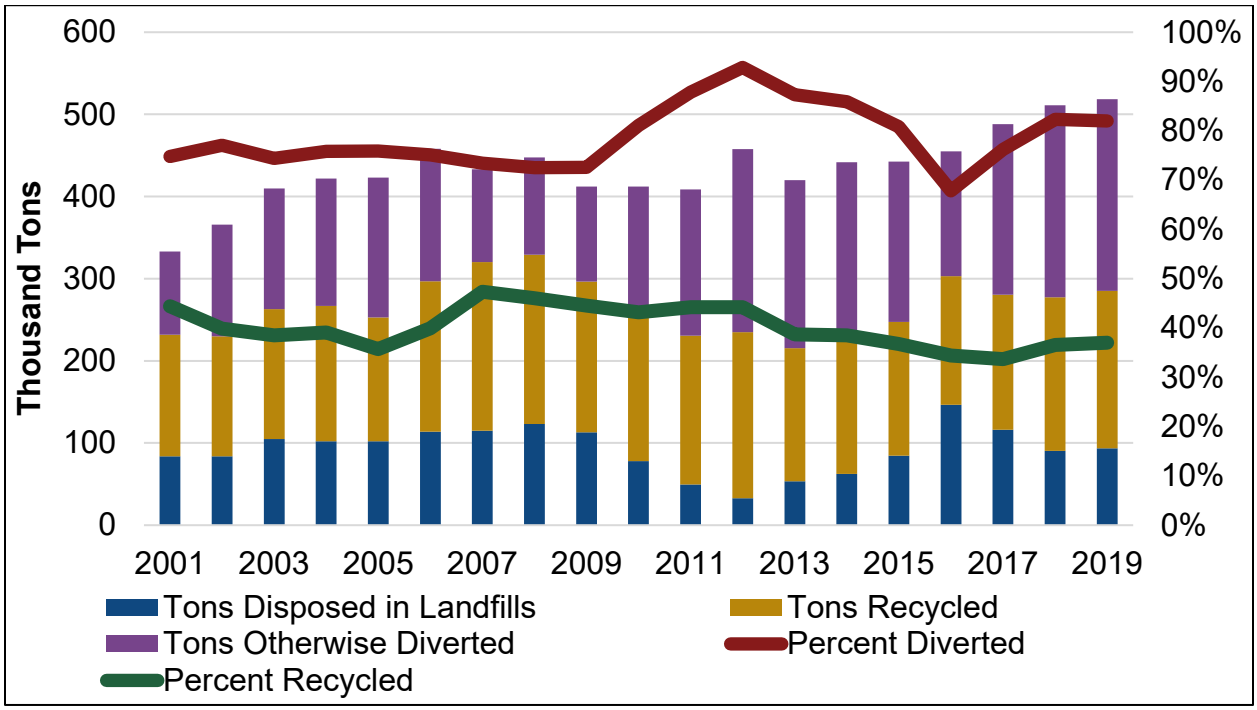


See source data for Figure 1 in Appendix C.

* PTE means Passenger Tire Equivalent, defined by CalRecycle (14 CCR § 17225.770) as 20 pounds. The PTE is useful for reporting purposes as a unit of measure; but in practice, tire weights vary significantly by type, and even passenger tires are generally more than 20 pounds.

Figure 2 shows the 18-year trend for waste tire diversion, recycling, and landfill disposal. Approximately 424,919 tons (42.5 million PTEs) were diverted to uses other than landfill disposal, slightly more than in 2018, but the diversion rate held steady at 82 percent. About 191,917 tons were recycled, excluding alternative daily cover (ADC) and tire-derived fuel (TDF), which are counted in this report as diversion but not recycling. The 2019 recycling rate of 37 percent, however, was also consistent with 2018.

Figure 2
Historical Waste Tire Recycling, Diversion and Landfill Disposal, 2001-2019[1]



See source data for Figure 2 in Appendix C.

Eighteen percent of the total was reused, including retreading and culling of used tires for resale, comprising 92,682 tons (9.3 million PTEs), about two percent higher than 2018. Sixteen percent of California waste tires, or 81,915 tons (8.2 million PTEs), were used to produce crumb rubber and ground rubber used in applications such as paving, synthetic turf infill, playgrounds, and a variety of landscape and building construction products. This is about seven percent less than in 2018. About 13,330 tons were used to produce tire-derived aggregate (TDA) used in civil engineering applications, three percent of the total and a 160 percent increase over 2018. At 28 percent of the total, the largest use for California waste tires was the 145,412 tons (14.5 million PTEs) exported as TDF or baled waste tires and treads, an eight percent increase over 2018. An additional 70,807 tons (7.1 million PTEs), 14 percent of the total, were used as TDF in California cement kilns, in addition to 8,900 tons (0.9 million PTEs) of tire fiber derived from California waste tire processing operations. Eighteen percent were disposed in

landfills, comprising 93,433 tons (9.3 million PTEs), slightly higher than the amount in 2018.

The COVID-19 global pandemic that hit California and the world in early 2020 has had a major impact on human health, the economy and virtually every aspect of life. While impacted, the waste tire management industry has continued to function on a "new normal" basis. Processors report waste tire collections and deliveries fell sharply in April but had generally rebounded and stabilized by late May, generally at 85 to near 100 percent of prior year levels, but in some cases lower. TDP manufacturers and installers have not reported major disruptions to the supply of tire-derived materials (TDM), but 50% (7 of 15) of respondents to an early May online survey reported some reductions in demand and/or customers. Some paving and sports field construction projects, however, have been accelerated due to empty schools and reduced drivers on the road.

According to the California Legislative Analyst's Office (LAO), the state has been in a deep recession since early March 2020 and the future pace of economic recovery is highly uncertain.[2] Due to projected reduced tire sales, CalRecycle tire program funding is expected to decline, as are several state and local infrastructure funding mechanisms that rely on consumer activity via gas tax, bridge tolls, and local sales tax mechanisms. Historically unprecedented state and local budget deficits are forecast and could further jeopardize these special funds that benefit California tire recycling.

Despite these trends and the uncertainty over the pandemic and economic recovery, it is possible that 2020 waste tire recycling levels may approach or even exceed the 2019 levels, if current strong activity in paving and turf infill continues and other segments are able to remain at or near 2019 levels. With expected declines in waste tire generation this could potentially translate into an increase in the recycling and diversion rates.

Section Five discusses several constraints to expand California tire recycling levels over the long term. In short, there is a need for expanded or new markets for TDM and TDPs that are sustainable and profitable to serve. Notwithstanding recent growth in molded products, positive trends in the paving market, and periodic upticks in civil engineering, experience has shown that such growth can be difficult and slow to realize. Some types of TDPs have competitive disadvantages compared to alternative products. And to successfully enter new markets, develop new TDPs, or undertake feedstock conversion efforts, manufacturers must be highly motivated and make a sustained commitment and investment that may pose risks and opportunity costs. To take advantage of any increases in market demand and expand use of California waste tires, the state's TDM suppliers need to be properly equipped and well positioned to secure customers. In some cases, access to financing and the relatively high cost of doing business in California may impede new investments.

CalRecycle has a long history of strategic waste tire market development approaches, including research, demonstration projects, technical assistance, funding, and policies to encourage or require TDP use. CalRecycle periodically makes strategic adjustments to the priorities, eligibility, compensation rates, and other terms for its funding programs.

[3] CalRecycle will begin updating the next Five-Year Plan for the Waste Tire Management and Recycling Program (Five-Year Plan) in November 2020. This includes a stakeholder engagement process providing opportunities for anyone with an interest in California tire recycling to provide suggestions and feedback.

1. Introduction

The Department of Resources Recycling and Recovery (CalRecycle) oversees management of waste and used tires as authorized by Senate Bill 876 (Escutia, Statutes of 2000, Chapter 838).† CalRecycle's long-term, informal goal is to achieve a 75 percent waste tire recycling rate consistent with requirements of AB 341 (Chesbro, Chapter 476, Statutes of 2011) that established a 75 percent statewide recycling rate goal for all materials by 2020. Affiliated tire program goals include:

- Developing long-term, sustainable, and diversified market demand for California tire-derived products (TDPs)
- Ensuring the protection of public health, safety, and the environment while developing a safe, high-quality supply infrastructure to meet that demand
- Fostering information flow and technology/product development

The Five-Year Plan for the Waste Tire Recycling Management Program guides CalRecycle's efforts. The most recent version was adopted in May 2019 and will be updated in Spring 2021 with stakeholder workshops beginning in Fall 2020.

This report summarizes California waste tire flows in 2019 and current trends as of spring 2020. Boisson Consulting prepared the report in partnership with industry specialist DK Enterprises with research support from RWR Strategies. Findings quantify use of California-generated waste tires in different market segments. Buffings from retreaders and out-of-state waste tires or TDM are excluded from findings on California waste tire flows although they are addressed in the report text. The authors strive to develop the most complete and accurate flow estimates possible while avoiding double counting. Notwithstanding data quality issues, we believe this report provides reasonably accurate and consistent data describing California waste tire market trends over time. Appendix B describes the methodology in more detail.

Following this introduction, Section 2 describes some broad trends currently impacting California waste tire management. Section 3 covers California's waste tire management infrastructure. Section 4 describes trends by market segment. Section 5 analyzes the outlook for increased diversion and recycling, and Section 6 offers concluding remarks. Appendix A is a glossary of key terms and acronyms. Appendix B covers the report methodology. Appendix C provides notes and source data for graphs and charts to make this report fully accessible to readers of all abilities in compliance with the American Disabilities Act, Government Code sections 11546.7, 7405, and 11135, and Web Content Accessibility Guidelines 2.0. Information sources are provided in end notes at the very end of the report.

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† Unlike some tire recycling studies, this report covers waste tires and used tires, including retread tires. See definitions and regulatory references in Appendix A.

2. Broad Trends Affecting California Waste Tire Management

Several broad trends are impacting California's waste tire management industry and markets. We briefly summarize these below and appropriately reference them in more detail in the remainder of report.

2.1 The Still-Unfolding COVID-19 Pandemic

The COVID-19 global pandemic that hit California and the world in early 2020 has had a major impact on human health, the economy, and virtually every aspect of life. There is great uncertainty regarding when and how the crisis may evolve. In the meantime, individuals, companies, and government agencies have been upended and must navigate this uncertainty while safeguarding health through social distancing and sanitation measures, disrupted supply and demand chains, and the prospect of a severe, prolonged recession.

As of mid-June 2020, California has experienced 153,560 total confirmed cases with 5,121 deaths and over 2.9 million tests performed.[4] A statewide stay at home order combined with county-specific requirements have been in place since mid-March but are now systematically being relaxed in stages, even while COVID-19 case counts continue to climb. Approval and widespread application of a vaccine appears to be at least several months, if not years, away.

The situation is changing rapidly. Following is a synopsis based on research conducted in April through early June 2020 that underlies this report's analysis.

2.2 COVID-19 Impacts to Current Waste Tire Management Operations

While the waste tire industry has been impacted, it has continued to function on a "new normal" basis. Haulers, processors, road and building construction and their supply chains have been deemed (with some local exceptions) essential activities as defined by federal and state agencies.[5] Most California firms engaged in these activities have continued to operate through the stay at home orders, sometimes at a reduced level and with new social distancing, sanitation, and personal protective equipment (PPE) requirements and with many administrative employees working from home. Two California waste tire processors chose to temporarily close their operations in March as the pandemic grew. One of these has since reopened.

In an online survey of waste tire management and recycling firms conducted in late April, 30 percent of respondents (six of 19) reported reductions in staff hours and 20 percent (four of 19) reported some furloughs or layoffs. In subsequent interviews, several additional firms said they had reduced hours and/or staffing levels, but most said the situation was improving steadily with increasing staff hours and some employees reinstated.

Most processors report that waste tire collections and deliveries fell sharply in late March and early April 2020, generally by about 10-15 percent but in at least two cases by 40 percent or more. Two processors with hauling operations reported inbound waste tire supplies increased and suggested this was because some independent haulers had suspended operations. Many processors said waste tire deliveries steadily increased in late May and appear to be stabilizing, most typically to a level of about 85 to near 100 percent of prior year levels, but in at least two cases closer to only 75 percent of normal.

TDP manufacturers and installers have not reported disruptions to TDM supplies. But in the online survey 50 percent (seven of 15) reported some reductions in demand and/or customers. In interviews, many retreaders said their production decreased as trucking levels dropped off in March – May 2020. But in some cases, demand has accelerated. For example, with schools and universities closed, turf and playground projects in the pipeline moved forward sooner than expected, and with less road traffic the same is true of paving work. Some companies reported difficulty finding transportation to haul product across the country.

The most cited COVID-related concerns were employee safety (12 of 16, 75 percent) and the potential for future supply and demand disruptions (eight of 16, 50 percent). Several companies also reported concerns over revenues, ability to meet payroll, and access to financing. Many have benefited from the federal Paycheck Protection Plan (PPP) and/or the Economic Injury Disaster Loan (EIDL) programs implemented in response to the COVID-19 induced economic downturn.

2.3 Abrupt Economic Decline and Uncertain Projections

California entered 2020 with a very strong economy after several years of consistent growth, historically low unemployment, some large-scale state building plans, and significant new funding earmarked for public infrastructure projects. As COVID-19 stay-at-home orders were instituted, this changed quickly, and according to the California Legislative Analyst's Office (LAO) the state has been in a deep recession since early March.[6] According to the California Employment Development Department (EDD), the unemployment rate jumped from 4.1 percent at the end of 2019 to 15.5 percent in April 2020.[7] It has since stabilized, with the June unemployment rate reported at 15.1 percent.[8] Nationally, in April 2020 consumer spending was down on an annual basis by 13.6 percent.[9]

The Federal Reserve Bank June median projections predict national GDP will decline by 6.5 percent in 2020 but rebound to five percent growth in 2021. However, their announcement also states, "The ongoing public health crisis will weigh heavily on economic activity, employment, and inflation in the near term, and poses considerable risks to the economic outlook over the medium term."[10]

Construction trends are tied to waste tire recycling as they influence demand for road paving, civil engineering, TDPs used in building construction, and demand for TDF used by California cement kilns. While some building and road construction companies are very busy and experiencing accelerated project schedules, a historic decline in

architectural billings may foretell a looming downturn. According to *Construction Dive*, the American Institute of Architect's Architecture Billings Index (a measure of new project inquiries and design contracts) declined significantly in April, with commercial and industrial projects falling the most.[11]

California retread facilities serve the trucking industry. According to the American Trucking Association, trucking serves as a barometer of the U.S. economy, representing 71.4 percent of tonnage carried by all modes of domestic freight transportation, including manufactured and retail goods. The Association reports their seasonally adjusted For-Hire Truck Tonnage Index contracted 12.2 percent in April, the steepest drop in 26 years.[12]

Another measure of economic decline is the collapse of oil prices, which in turn influences the competitiveness of TDM in certain applications, the economic potential for emerging technologies such as devulcanization and pyrolysis, and pricing for exported TDF. The price per barrel for West Texas Intermediate crude oil began the year at $63.05, and with the onset of COVID-19 plunged to a low of $16.94 in late April, before rebounding to $39.60 on June 8. Consistent with this trend, the Caltrans Statewide Crude Oil Index plunged from 350.5 in February to 109.0 in May before rebounding to 214.8 in July. Caltrans adjusts payments under certain asphalt paving contracts if the index changes more than five percent when projects are implemented compared to when the bid was submitted.[13] While oil pricing has been relatively stable in June and early July, the future is uncertain.

Industry stakeholders interviewed for this study expressed a spectrum of expectations ranging from a quick rebound to extended downturn. How quickly the economy recovers will depend in large part on how the public health risks and policies evolve, and how soon people are comfortable returning to pre-COVID-19 levels of activity, and unfortunately this is all highly uncertain.

2.4 Growing Budget Deficits and Reduced Funding

While economic projections are uncertain, large government budget deficits and significantly reduced funding for waste tire management and infrastructure projects tied to use of recycled TDM appears likely. This is reflected in official projections by the California LAO which recently offered two separate scenarios for California's economic trajectory: a somewhat optimistic scenario and a somewhat pessimistic scenario leading to state budget deficits of $18-$31 billion. But the LAO also adds, "These scenarios do not depict the best case or worst case. Outcomes beyond the range of our scenarios—especially those worse than we show—are entirely possible."[14] The report goes on to project annual budget deficits persisting until at least 2023-24.

In late April, the U.S. Tire Manufacturing Association (USTMA) projected total U.S. sales of tires would drop in 2020 by 17.3 percent.[15] USTMA Staff have since said this projection may be improving; however, most expect a significant drop in tire sales in 2020. A decline in tire sales would reduce CalRecycle tire program funding, which is derived from a retail fee on tire sales. CalRecycle is currently assessing this issue and

the need for short-term budget cuts and will update its waste tire programs accordingly, as it launches the process to update the Five-Year Tire Plan beginning in November 2020. The California tire fee that funds CalRecycle tire-related activities is due to sunset on January 1, 2024.[16]

COVID-19 impacts also include a likely sharp reduction in state and local infrastructure spending that could reduce demand for TDM in key markets. With the adoption of the Road Repair and Accountability Act (SB 1, Beall, Chapter 5, Statutes of 2017) and failure of a 2019 citizen ballot initiative that could have overturned key provisions, $50 billion (over 10 years) in statewide infrastructure spending was expected to be available, in addition to several billion more from over two dozen local transportation funding initiatives. This funding was expected to have a significant beneficial impact on overall paving activity including use of asphalt rubber products. It could also potentially boost use of TDA in civil engineering projects and molded traffic safety devices.

Several stakeholders said they expect deep cuts in this infrastructure spending due to reduced consumer activity combined with the potential for local and state government to shift funding to other priorities, especially as deficits rise to historic levels. But according to one analysis from mid-May, the actual impact on the state's transportation agencies is uncertain. On one hand, transportation funding from fuel taxes is anticipated to drop by $1.8 billion through the 2024-25 fiscal year:

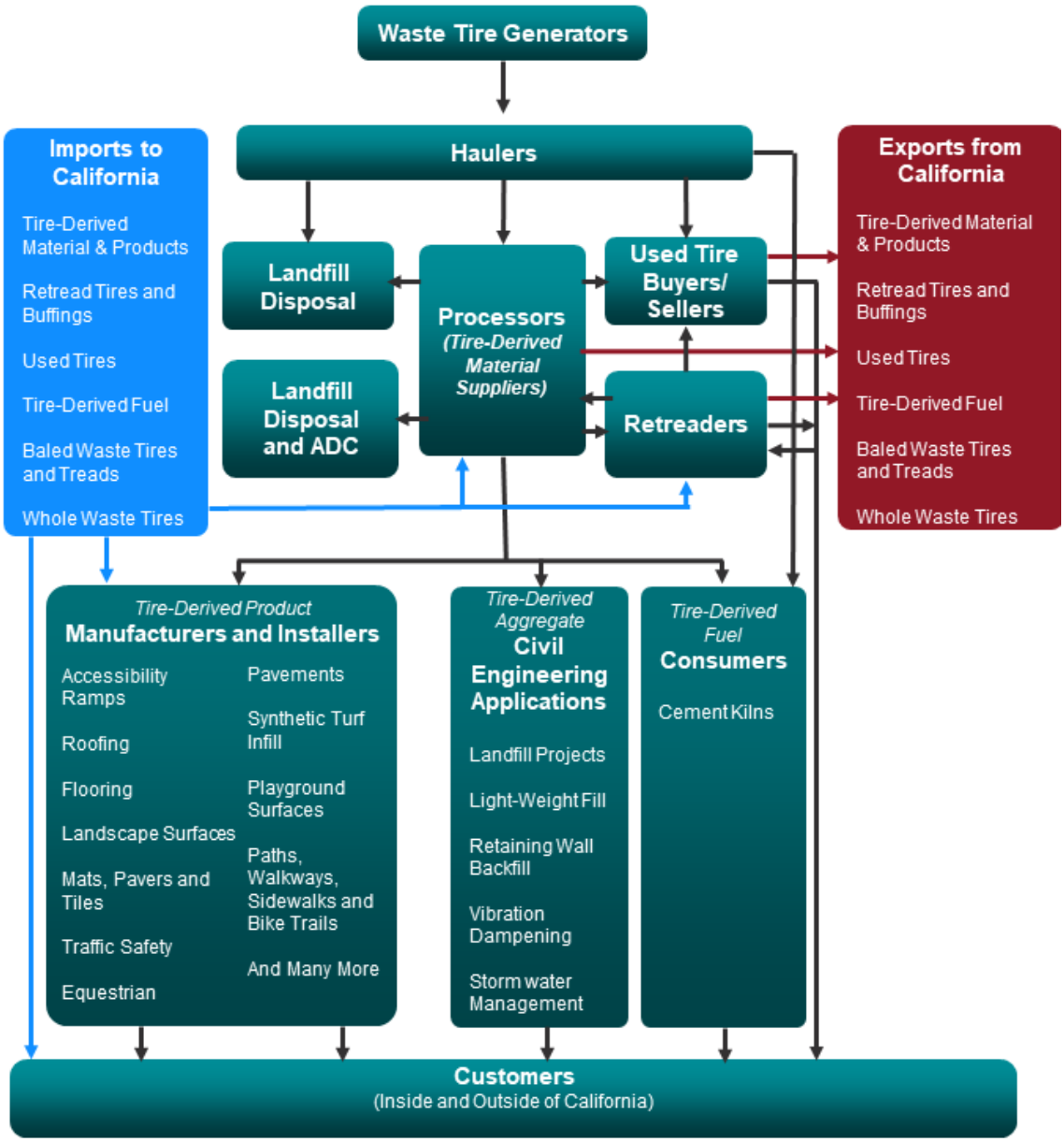
- The State Highway Operations and Protection Program (SHOPP) will see a reduction of $556 million.
- The State Transportation Improvement Program (STIP) will see a reduction of $91 million over the current and 2020-21 fiscal years.
- Cities and counties will lose $282 million in local streets and roads funds.
- The Governor has already outlined several transit-related mechanisms to balance the budget, including delaying new programs, shifting resources, and program cuts.

But on the other hand, the Governor has also instructed Caltrans to accelerate projects to achieve cost savings, support the creation of new jobs, and improve roads as a way to restart California’s economy.[17] Moreover, there is continued speculation regarding additional federal stimulus programs that could potentially include significant new funding for state infrastructure projects, which could further alleviate any cutbacks. One proposal called for a $50 billion federal infrastructure stimulus package with $4.5 billion flowing to California.[18] Still, baring additional stimulus funding or other measures, the impacts to ongoing transportation and other infrastructure funding could be significant.

3. California Waste Tire Management Infrastructure

Figure 3 illustrates how waste tires and TDM flow to and from California waste tire management companies and facilities.

Figure 3
California Waste Tire Recycling Industry Flow Chart



See detailed description of Figure 3 in Appendix C.

CalRecycle's online California Tire-Derived Produce Catalog provides detailed maps, directories with company contact information and product information. The catalog is available online.

Over 1,300 registered waste tire haulers provide waste tire collection services to over 23,000 registered waste tire generators (e.g., tire dealers and auto shops) located throughout the state. Registered haulers may also ship used tires and TDM, and some own and operate waste tire facilities. Currently, 25 California facilities have a minor waste tire facility permit allowing up to 4,999 tires on site and 16 have major waste tire facility permits with maximums ranging from 10,000 to 336,300 PTEs. These facilities may perform their own hauling, arrange hauling with outside firms, and/or receive waste tires from independent haulers.

This study focused largely on analyzing flows to and from 21 facilities that managed over 85 percent of California waste tires in 2019. The remaining waste tires were either hauled directly to a landfill equipped for size reduction and disposal or to a cement kiln using whole waste tires as TDF. Some tires were casings destined for retreading or used tires culled before reaching the processor.

These facilities differ in their business models, priorities, and equipment, which determines their capacity to produce different types of size reduced TDM:

- Eight are permitted to produce various specifications of crumb rubber and/or ground rubber. Of these, two did not produce crumb or ground rubber in 2019, although one has since started in 2020. Three facilities accounted for over 95 percent of production.
- Five produced size reduced TDF for in-state and/or export sales in 2019.
- Four produced bales of waste tires and one produced bales of truck tire treads for export and use as TDF. Another facility recently permitted in 2020 also plans to export bales of truck tire treads.
- One facility that received a new waste tire facility permit in 2019 produces cut-and-stamped TDPs from bias-ply truck tires only.
- Three have produced TDA for civil engineering in recent years.
- Two are equipped to size reduce tires for disposal or ADC use only.

The above listing totals more than 21 because some facilities are referenced more than once.

There were several changes in California waste tire facility ownership and management that could potentially lead to new investments and changes in California processor business models, capacities, and priorities.

Processing facilities derive revenue from the fees they charge to pick-up or receive waste tires, and they compete to varying degrees for waste tire accounts in the

collection arena. Some Northern California survey respondents report that competition for waste tire supplies intensified in 2019 and 2020, reducing pricing and associated revenue streams.

The California TDP Catalog currently identifies 14 California tire-derived product manufacturers and nine installers that use California-sourced TDM. These firms offer a wide range of products as illustrated by the detailed product sales sheets presented in the catalog under 16 product categories. Each year sees changes to the companies, products, and level of California activity (including use of California TDM feedstocks).

In addition, several companies engaged in synthetic turf design, sales, and/or installation in California were identified, including companies that focus on removal and reuse of end-of-life turf systems. We also identified 14 companies that own and operate 44 asphalt rubber blending units and consume crumb rubber for use in various paving products and applications.

Forty retreaders were identified. While most handle truck tires, a few specialize in various types of airplane or industrial tires. The retread industry is very competitive and has been experiencing a consolidation trend with many changes in business ownership and affiliations in recent years.

In 2019, 16 landfills were identified that disposed significant quantities of waste tire shreds, of which seven accounted for over 90 percent of all waste tire landfill disposal. Three landfills reported using TDM as ADC, one of which closed in early 2020. Five landfills reported using TDA in civil engineering applications.

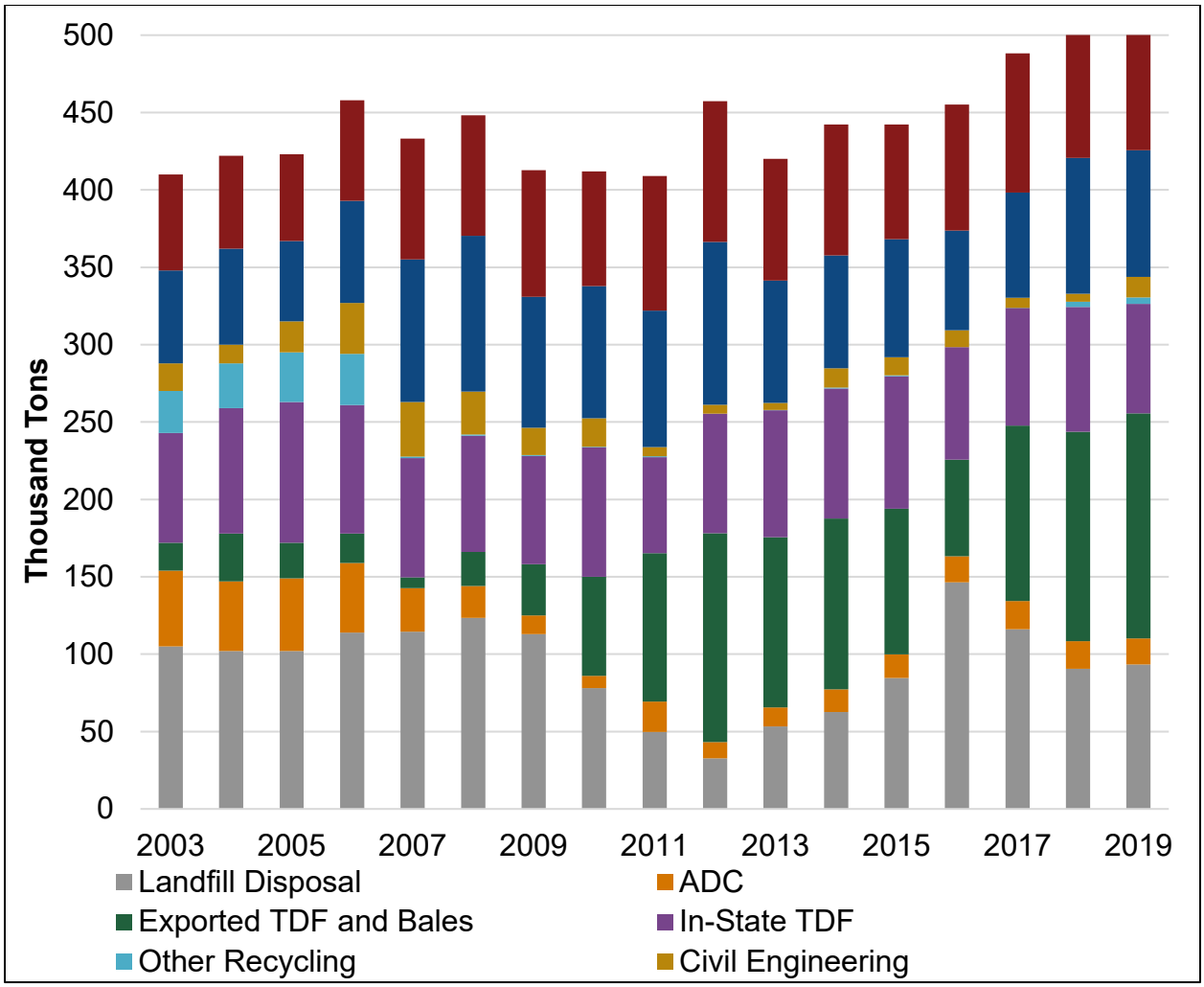
Companies periodically make inquiries about potentially establishing various types of waste tire management facilities and operations in California, including companies investigating potential ventures involving crumb or ground rubber, TDP manufacturing and installation, devulcanization, TDF or bale export, and pyrolysis. CalRecycle typically provides information on available tire and recycling market development support and makes referrals to the California Governor's Office of Business and Economic Development (GO-Biz). Recently, some companies said that previous interest in new investments are now on hold or being re-evaluated in light of the COVID-19 related economic downturn and uncertainty discussed in Section 2.

4. Trends by Market Segment

4.1 Overview and Historic Data

Figure 4 shows the long-term trend in uses of California-generated waste tires, and Table 1 (on the next page) lists estimated flows and percentages in detail for the past three years.

Figure 4
Historical Market Trends by Segment, 2003-2019[1]



See Figure 4 source data in Appendix C.

Table 1

Estimate End-Uses for California-Generated Waste Tires, 2017-2019

Category	2017 Tons	2017 Million PTEs	2017 Percent of Total	2018 Tons	2018 Million PTEs	2018 Percent of Total	2019 Tons	2019 Million PTEs	2019 Percent of Total	Percent Change 2018-2019
Retreads	48,409	4.8	9.9%	47,925	4.8	9.4%	47,925	4.8	9.2%	0%
Used Tires (Domestic)	34,174	3.4	7.0%	34,512	3.5	6.8%	36,072	3.6	7.0%	5%
Used Tires (Export)	7,202	0.7	1.5%	8,180	0.8	1.6%	8,685	0.9	1.7%	6%
Subtotal, Reuse	**89,784**	**9.0**	**18.4%**	**90,617**	**9.1**	**17.7%**	**92,682**	**9.3**	**17.9%**	**2%**
Crumb Rubber and Ground Rubber	**68,142**	**6.8**	**14.0%**	**87,740**	**8.8**	**17.2%**	**81,915**	**8.2**	**15.8%**	**-7%**
Landfill TDA Uses	5,583	0.6	1.1%	4,021	0.4	0.8%	6,682	0.7	1.3%	66%
Non-Landfill TDA Uses	853	0.1	0.2%	1,106	0.1	0.2%	6,648	0.7	1.3%	501%
Subtotal, TDA	**6,436**	**0.6**	**1.3%**	**5,127**	**0.5**	**1.0%**	**13,330**	**1.3**	**2.6%**	**160%**
Other Recycling	**76**	**Neg.**	**0.0%**	**3,455**	**0.3**	**0.7%**	**3,991**	**0.4**	**0.8%**	**NA**
TDF Exports	87,317	8.7	17.9%	99,197	9.9	19.4%	114,427	11.4	22.1%	15%
Baled Tire and Tread Exports	26,089	2.6	5.3%	36,039	3.6	7.0%	30,985	3.1	6.0%	-14%
Subtotal, TDF and Bale Exports	**113,405**	**11.3**	**23.2%**	**135,236**	**13.5**	**26.5%**	**145,412**	**14.5**	**28.1%**	**8%**
TDF (In-State)	**75,989**	**7.6**	**15.6%**	**80,603**	**8.1**	**15.8%**	**70,807**	**7.1**	**13.7%**	**-12%**
ADC	**18,108**	**1.8**	**3.7%**	**17,975**	**1.8**	**3.5%**	**16,784**	**1.7**	**3.2%**	**-7%**
Landfill Disposal	**116,214**	**11.6**	**23.8%**	**90,508**	**9.1**	**17.7%**	**93,433**	**9.3**	**18.0%**	**3%**
Total Managed	**488,153**	**48.8**	**100.0%**	**511,262**	**51.1**	**100.0%**	**518,353**	**51.8**	**100.0%**	**1%**
Total Landfill Diversion	**371,940**	**37.2**	**76.2%**	**420,754**	**42.1**	**82.3%**	**424,919**	**42.5**	**82.0%**	**1%**
Total Recycled	**164,438**	**16.4**	**33.7%**	**186,939**	**18.7**	**36.6%**	**191,917**	**19.2**	**37.0%**	**3%**
Imported Waste Tires	49,906	5.0	10.2%	26,934	2.7	5.3%	5,698	0.6	1.1%	-79%

The methodology used to develop the findings in Table 1 is described in Appendix B, including considerations on interpreting and using the statistics. In short, estimated flows of California waste tires exclude imports, including a proportionate share of outbound TDM or used tire shipments for processors that receive a share of their inbound waste tire supplies from out of state. Likewise, the flow estimates exclude buffings from retreader operations, although buffings are briefly discussed in Section 4.3 below along with crumb rubber market trends.

The California waste tire flow estimates presented in Table 1 are based on detailed and systematic analysis of information from numerous sources, including industry surveys, CalRecycle databases and records, and broad Internet research combined in some cases with adjustments to account for certain data gaps where necessary. The authors strive to develop the most complete and accurate estimates possible for each market segment while avoiding double counting. Notwithstanding various data gaps, data quality issues and conflicting sources of information, this report provides reasonably accurate information to evaluate California waste tire market trends over time. Appendix B provides additional methodology details and guidance on interpreting results.

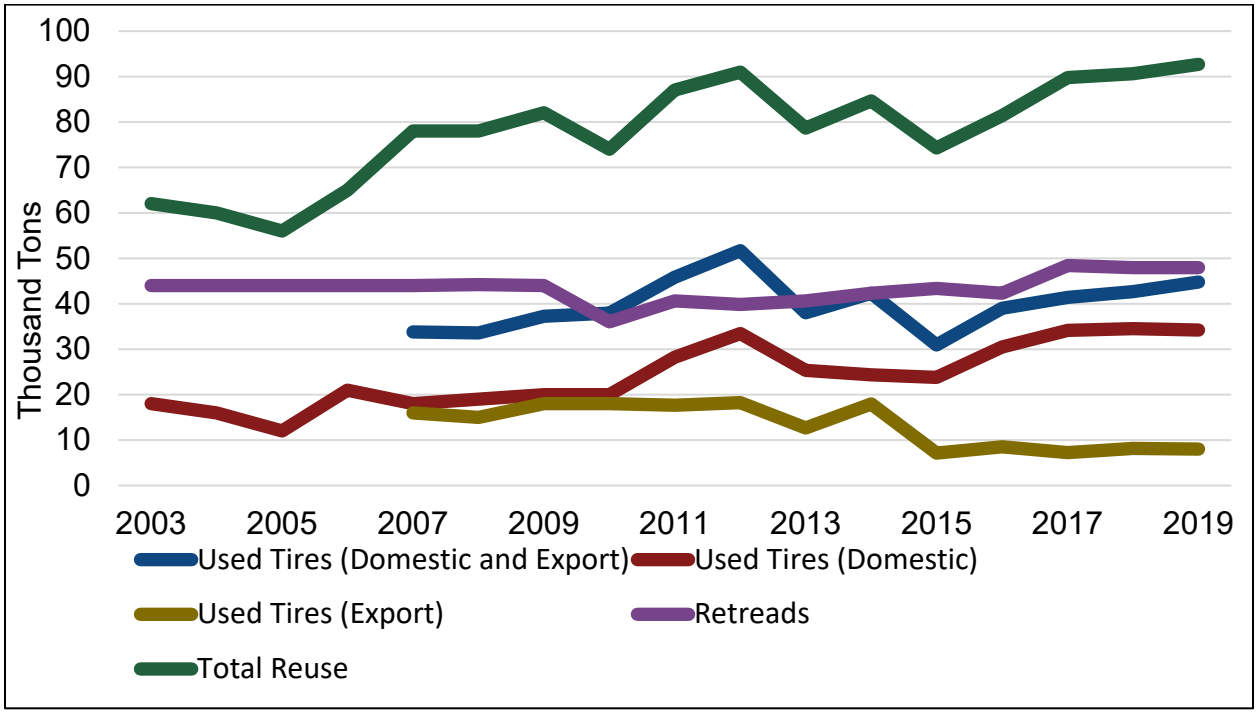
4.2 Reuse

Although they are very distinct market segments, in this report retreading and culling of used tires are both categorized as reuse, as illustrated in Figure 5. Both retreading and used tires are relatively stable, strong, and profitable market segments. Based on industry surveys, feedback on trends and analysis of available data, total California tire reuse in 2019 comprised about 18 percent of the total, at 92,682 tons (9.3 million PTEs), about two percent higher than in 2018.

Retread Tires

Based on survey results and interviews with California retreaders and national industry representatives, we estimate that the quantity of tires retreaded in California in 2019 remained about the same as in 2018 at 47,925 tons (4.8 million PTEs), while nationally retread volumes may have increased slightly by up to one percent. Forty retreading facilities were identified in California. The industry continues to experience strong competition and a consolidation trend, with several acquisitions, changes in ownership, and closures in 2019. Nationally, five retreader brands account for over 96 percent of the retreader market.[19]

Figure 5
California Waste Tire Reuse, 2003-2019[20]



See Figure 5 source data in Appendix C.

For years, U.S. retreaders have steadily lost market share to low-cost, low-tier tires imported from China. These imported tire sales shifted some customers away from retread truck tires due to their low cost, even though they are reportedly not able to be retread due to their low amount of tread. A system of duties and tariffs had been imposed in 2016 but were then rescinded in early 2017. However, in January 2019 the International Trade Commission reversed its earlier decision and ruled that Chinese imports of certain truck and bus tires were in fact harming the U.S. tire market. In response countervailing duties of 21 to 63 percent and antidumping duties of 9 to 23 percent were implemented in February 2019.[21] Several California retreaders noted that they benefited from this change. However, California retreaders still reported a range of increased and decreased sales overall for 2019. Nationally, retreading volumes were reportedly up slightly by about one percent in 2019. CalRecycle is currently executing a new contract to promote retreading through education and training to select state agencies and private sector fleets.

Used Tires

An estimated 44,757 tons of used tires (4.5 million PTEs) were culled from California waste tires flows and sold for reuse in 2019, about five percent higher than in 2018, with just under 19 percent of these exported. The percentage of used tires in the waste tire stream and the extent to which they are culled depends on such factors as the type of

generator, the terms required of haulers by generators, and whether the haulers are independent or affiliated with or operated by processors who receive waste tire flows.

Export of used tires to Mexico is formally capped by an annual import quota established by a working group comprised of Mexico's federal Secretariat of Economy, Baja California's Secretariat of Environmental Protection (SPA), and local used tire dealer associations. This quota has averaged slightly over 750,000 tires per year from California in recent years (2008-2017).[22] Recent renegotiation of the North American Free Trade Association has reportedly not impacted this arrangement.

In 2019, California AB 949 (Medina, Statutes of 2019, Chapter 266) was enacted, prohibiting an automotive repair dealer from installing an unsafe used tire. The bill defines safety criteria, including a minimum of 2/32 inch of remaining tread.

4.3 Crumb Rubber and Ground Rubber

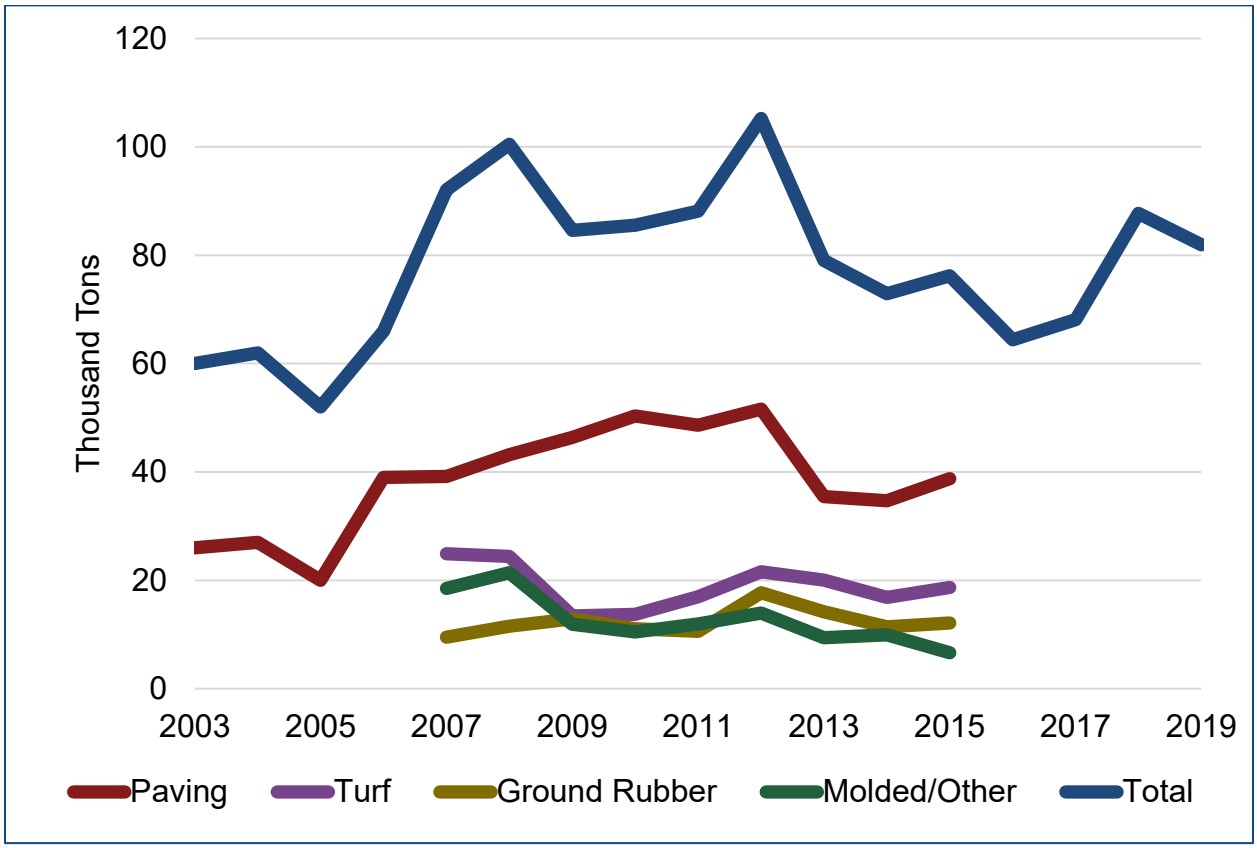
Overview

In 2019, 81,915 tons of California waste tires (8.2 million PTEs) were used to produce crumb rubber (i.e., TDM less than ¼ inch in size) and ground rubber (i.e., TDM of ¼ inch to 1 inch in size). We estimate total production of California crumb rubber and ground rubber in 2019 was 110130 million pounds. As in the last three annual California Waste Tire Market Reports, we report production for sub-categories under the Crumb Rubber and Ground Rubber main category as a range only to protect confidentiality as only three TDM feedstock producers currently account for over 95 percent of California crumb rubber production.

Buffings from retreaders are excluded from these estimates and are not counted in recycling rates because the retreaded tires they originated from are already counted under retreads. Screened buffings of various sizes are used in certain market segments, especially pour-in-place playground surfacing, molded products, landscape mulch, and turf infill products. While not quantified in 2019, based on prior surveys and trends we estimate that well over 14 million pounds of buffings were sold by California retreaders in 2019. Buffings continue to be in high demand. Also, while a complete estimate of the quantity of tire wire and fiber residuals generated by California TDM producers in 2019 is not available, most wire is recycled. In Southern California where most residual tire fiber is generated 8,900 tons were consumed as cement kiln fuel.

As illustrated in Figure 6, the use of California waste tires to produce crumb and ground rubber hit a peak in 2012 of 105,244 tons (10.5 million PTEs) but then annually declined to hit a 12-year low of 64,408 tons (6.5 million PTEs) in 2016. Since then, crumb/ground rubber production has increased two years in a row before modestly declining in 2019.

Figure 6
California Waste Tires Used to Produce Crumb Rubber and Ground Rubber, 2003-2019[23]



See Figure 6 source data in Appendix C.

Going into 2020, a positive demand trend combined with available capacity showed potential for a sharp boost to California crumb rubber production. The COVID-19 related economic downturn and uncertainty discussed in Section 2 may dampen demand and the attractiveness of investments in coming years, but it is possible that crumb rubber production could still grow in 2020. Two facilities in northern California are permitted to produce crumb rubber but did not in 2019, although one of these has since started in 2020. Subject to several business and market related considerations as described in Section 5.3 below, if demand for crumb rubber and/or ground rubber increases, production could potentially be increased through investments in existing or new facilities.

Following is a summary of market segments within the broader crumb rubber and ground rubber category.

Paving

Asphalt rubber paving is the largest market for California produced crumb rubber. Drivers include:

- **The California Road and Repair Act (SB 1, Beall, Chapter 5, Statutes or 2017)**
  The act was expected to funnel an estimated $50 billion in gas tax revenue to infrastructure projects over the next 10 years, split 50/50 between state and local projects. More than two dozen new local transportation funding initiatives were also adopted in recent years that rely on bridge tolls, sales tax, or gas taxes. As discussed in Section 2, COVID-19 stay-at-home orders have drastically reduced revenue generation from these sources in early 2020, and future funding may potentially be diverted to other state budgetary priorities, given historically high budget deficits.

- **Caltrans Asphalt Rubber Use Mandate**
  Caltrans is required by statute (AB 338, Levine, Chapter 709, Statutes of 2005) to use tire asphalt rubber in 35 percent of its paving projects. According to a Caltrans 2017 report[24] (the most recent available as of the writing of this report) the agency used asphalt rubber in 45 percent of a total of 3.7 million tons of asphalt, consuming a total of 58.5 million pounds of crumb rubber.

- **Caltrans Rubberized Hot Mix Asphalt (RHMA) Surface Pavement of Choice Policy**
  Combined with long-standing use by certain local governments (especially in Southern California), this has helped establish a solid base of demand for asphalt rubber products and applications. It also ties a portion of crumb rubber use directly to the total amount of surface paving performed. Some say, however, that some districts fail to consistently enforce this policy. A recent Caltrans policy change provides exemptions to this policy for open graded pavements. However, some industry representatives said they did not believe this new policy would drastically reduce overall asphalt rubber usage. In recent years, , the so-called a “PG+X” Committee (named for the goal of increasing recycled content in Performance Grade asphalt by a factor yet to be determined), has explored a variety of policies to further boost crumb rubber use. Some industry representatives said they did not expect policy changes from this initiative in the near term.

- **CalRecycle Rubberized Pavement Grants**
  CalRecycle continues to allocate significant funding to local government rubberized paving grants.[25] The current Five-Year Tire Plan allocates $4,387,000 and $3,787,000 for FYs 2020–21 and 2021–22, respectively.

Most paving industry representatives contacted said that paving activity in general and asphalt rubber was flat or somewhat down in 2019. After a failed 2018 citizen's initiative aimed at scaling back SB 1, many had hoped for a large uptick in paving activity in 2019. But by most accounts Caltrans and local agencies were not able to complete the engineering required to release bid documents.

In 2019, fourteen companies were identified that own and operate a total of 44 asphalt rubber blending units used to produce binder for RHMA products. Some of these firms use their blenders at their own hot mix asphalt (HMA) plants to produce asphalt rubber binder for their own projects. Some are "custom blenders" that supply asphalt rubber binder or RHMA to other paving firms. Some use their own blenders to meet a portion of their company demand and purchase additional RHMA from custom blenders. Many blender units are mobile, and some are occasionally transported for use in other states, reducing the maximum capacity to produce RHMA in California that would otherwise be available. Some of these blender units may not see significant use because of competitive pressure and changes in company practices over time.

After adjustments to avoid double counting, 11 companies operating a total of 37 blender units reported consuming approximately 75 million pounds of crumb rubber. An additional three companies owning 7 additional blender units did not respond to the survey. We separately estimate that California producers supplied about 60–75 million pounds of crumb rubber into the market, implying that some portion of California paving crumb rubber demand was met by out-of-state producers.

For comparison, Caltrans reported consuming 61 million pounds of crumb rubber in 2017 paving projects, according to the most recently available report. Based on a compilation of Caltrans bid documents by the Rubber Pavement Association, in 2019 published Caltrans bid documents called for production of 1.3 million tons of RHMA and 1.9 million tons of conventional HMA. (It must be noted that bid documents may not correlate exactly with actual usage due to changes in planned projects.) Assuming eight percent binder containing 20 percent crumb rubber on average, 1.3 million tons of Caltrans-produced RHMA would consume 42.3 million pounds of crumb rubber, or about 56 percent of the 75 plus million pounds of total demand estimated above, with the remainder used in local paving projects. One industry representative commented that this ratio of state and local paving activity appears reasonable for 2019.

Two companies said they were considering investments in new blender capacity, but one of these said they had put the potential investment on hold due to COVID-19 pandemic concerns. Some firms reported that they are not utilizing their blending units at their maximum capacity.

Paving industry stakeholders said that paving bids, including bids specifying asphalt rubber use, increased steadily in Spring 2020, and most were optimistic that production may exceed 2019 levels, notwithstanding COVID-19 pandemic issues. A representative of Caltrans confirmed that they believe funding is safely in place for planned paving projects through the end of calendar year 2020.

Turf Infill

In 2019, we estimate that 10–15 million pounds of California-produced crumb rubber was used as infill in synthetic turf athletic fields. While a significant amount, this is significantly down from the average of 23.6 million pounds of California-produced crumb rubber sold into the turf infill market each year between 2013 and 2016. According to industry stakeholders, the synthetic turf industry has continued to grow steadily in recent years at five to ten percent per year or more. In 2019, about 125–150 new synthetic turf athletic fields were installed in California (many of which replaced existing natural grass fields). In addition, more than 50 replacement fields were installed where existing synthetic turf athletic fields had reached the end of their life (EOL). Synthetic turf sports fields are typically warranted for eight years, but actual life expectancy depends to a great extent on the frequency and type of usage and the maintenance it receives.[26]

The amount of crumb rubber used in this market has been dropping, even as the number of fields installed increases, for two reasons. First, several years of persistent media reports related to perceived environmental health and safety issues have prompted the industry to explore alternative infill materials. According to turf industry representatives, nationally about 90 plus percent of new fields are still using crumb rubber and sand infill mixtures. But in California we estimate the rate is only 50–70 percent, with more fields in Southern California using crumb rubber-sand and fewer in Northern California. This is down from roughly 98 percent market share for crumb rubber and sand infill materials just a few years ago.

Several recent studies have published findings supporting the safety of using crumb rubber as infill in synthetic turf athletic fields. But stakeholders are still awaiting results from two major studies. A CalRecycle-sponsored study being prepared by the California Department of Environmental Health Hazard Assessment (OEHHA) has been underway since June 2015.[27] Additionally, a national study sponsored by multiple federal agencies has been underway since February 2016.[28]

The second reason for declining use of newly produced crumb rubber as turf infill is the trend toward reuse of end-of-life (EOL) crumb rubber and sand infill material as infill in replacement fields. While this practice varies among designers, drivers include cost savings through reduced purchase of new crumb rubber, reduced landfill disposal costs, and sometimes direct customer requests. In California in 2019, we estimate that about 40–60 percent of replacement fields reused a portion of EOL crumb rubber and sand infill materials. EOL crumb rubber and sand infill materials are also sometimes used as horse arena footing.

Synthetic turf field construction was expected to grow again in 2020, but this is now uncertain due to the COVID-19 pandemic and related economic downturn. Some projects have reportedly been canceled, but many others have been accelerated as builders took advantage of school closures caused by stay-at-home orders. Some industry representatives say they still expect some growth and that currently they are

busier than ever. Several do expect a dip in construction in 2021 before a hoped for rebound in a recovering economy.

Ground Rubber

This segment includes TDM that may range from ¼ inch up to one inch in size. Ground rubber is used in playground surfacing, porous walkways, paths and bike trails, horse arena footing, landscaping, and military ballistics applications. In 2019, about 5–8 million pounds of California-produced ground rubber was sold into these market segments, slightly less than the amount in 2018. Some products and uses in this segment are made with ground rubber and screened buffings from retreading but this estimated usage excludes buffings. One California supplier of these TDM products closed at the end of 2018.

Molded and Other Tire-Derived Products

This diverse market segment includes a range of products such as flooring, roofing, tiles, industrial underground couplings, and traffic safety devices, among others. In 2019, we estimate that 28–38 million pounds of California crumb rubber was used in this market segment, about 10 percent more than in 2018 but two to three times the amount used in the previous few years. Some products in this segment are made using screened buffings from retreading in addition to crumb rubber, but this estimated usage excludes buffings.

In 2019, eleven manufacturers in this segment participated in CalRecycle's Tire Incentive Program (TIP).[29] The TIP provides a reimbursement of 10 to 50 cents per pound to eligible California manufacturers that use qualified TDM made from California waste tires in the production of eligible TDPs that are sold to customers. TIP participants reported purchasing 21.7 million pounds of crumb rubber and buffings combined, of which 16.6 million pounds were used to make products that were sold and reported to the program for incentive payments. Several eligible manufacturers exceeded the maximum amount of payments for crumb rubber used in TDPs sold to customers that was approved under their TIP award, in two cases by a large margin. The TDM feedstock suppliers also benefited by increased sales for the quality and specified TDM used in TDPs covered under the TIP. In one case, the TIP incentive aided in the decision for a manufacturer to shift from using an out-of-state supplier for a portion of their TDM needs to solely using an in-state supplier. Another manufacturer shifted to using an in-state supplier for their California operation and two out-of-state operations.

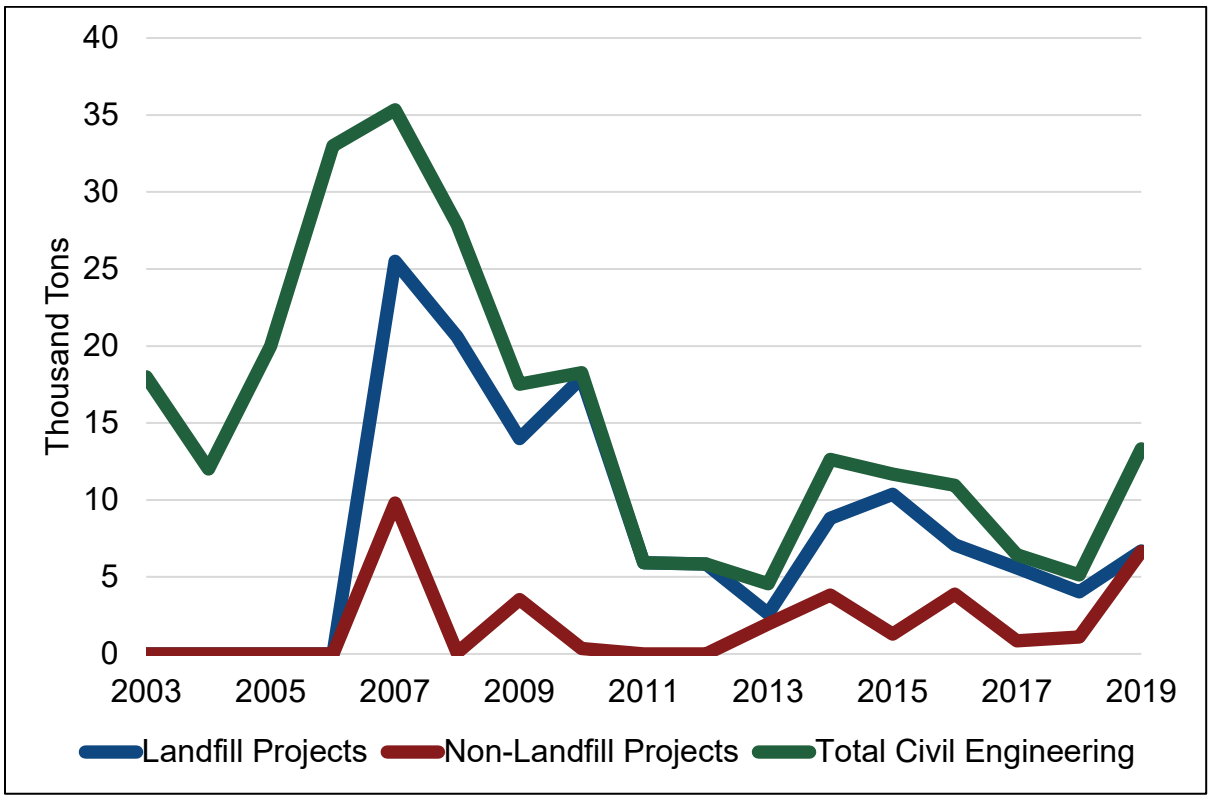
The Tire Incentive Program application for fiscal year (FY) 2020–21 are due August 20, 2020. The current Five-Year Tire Plan allocates $4,468,000 and $3,418,000 for FYs 2018–19 and 2019–20, respectively, for the program. Support for some firms in this segment is also provided through CalRecycle's Feedstock Conversion Technical Assistance and Material Testing Services contract and Tire-Derived Product (TDP) Grant Program. The next TDP Grant Program cycle is tentatively expected in Spring 2021.

Some TDP manufacturers said they have difficulty competing with low-cost imported products. Several manufacturers said they had seen some level of disruption to customer demand due to the COVID-19 pandemic and economic fallout while others cited increased demand due to accelerated construction project schedules or a surge in online consumer sales. While demand may be strengthening, it is unclear what the trend will be in 2020.

4.4 Civil Engineering

As shown in Figure 7, use of TDA in civil engineering applications peaked in 2007 at over 35,000 tons (3.5 million PTE) and then declined until 2013. It has steadily risen and become more regular since then, with sporadic spikes and dips, especially in non-landfill applications. In 2019, TDA use in California was estimated at 14,093 tons (1.4 million PTEs). However, about 764 tons of TDA was derived from out-of-state waste tires processed at California facilities, leaving 13,330 tons (1.3 million PTE) of California-generated TDA, a 160 percent rise over 2018. The projects currently on the books imply a drop in TDA use in 2020, although project timing and potential new projects in the pipeline could result in similar usage as 2019.

Figure 7
California Waste Tires Used in Civil Engineering, 2003-2019[30]



See Figure 7 source data in Appendix C.

CalRecycle is adopting new TDA grant guidelines intended to streamline and increase grant demand, including adjustments to reimbursement rates for installation and engineering and design costs based on project type and new reimbursements for geo synthetic materials where needed, among other changes. The current Five-Year Tire Plan allocates $850,000 each year to the TDA Grant Program for FYs 2020–21 and 2021–22. Two solicitations are planned with applications due in September 2020 and again in January 2021.[31]

Landfill Civil Engineering Applications

In 2019, five landfills reported using a total of 7,025 tons of TDA (0.7 million PTE) in civil engineering projects mainly tied to landfill gas collection operations. This was 66 percent higher than in 2018. Four of these landfills indicate they will continue to use TDA, and levels may approach or even exceed the 2019 level.

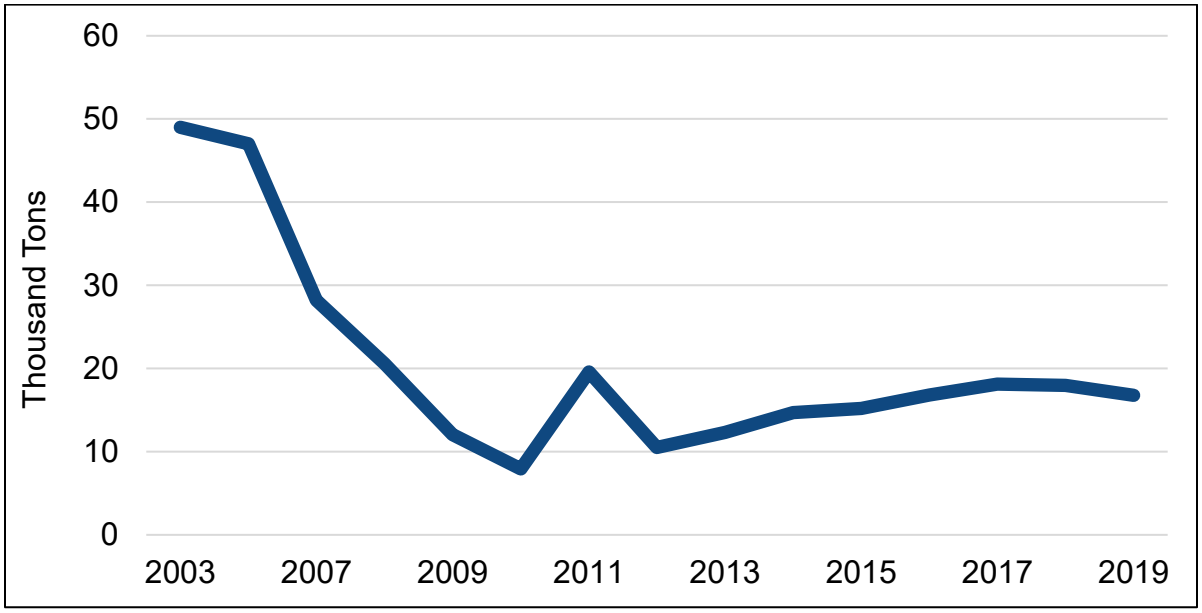
Non-Landfill Civil Engineering Applications

In 2019, non-landfill construction-related civil engineering projects used 7,068 tons (0.7 million PTEs), a more than five-fold increase over the amount in 2018. These projects included landslide and road repairs in Yuba and Tuolumne counties and embankment and retaining wall backfill in Napa and Yuba counties. Two projects are on the books for 2020 and coming years: the completion of the Tuolumne County project and road construction activities at a Sacramento County landfill. Although project timing is not certain, construction TDA use may decline somewhat in 2020.

4.5 Alternative Daily Cover

About 16,784 tons of tire shreds (1.7 million PTEs) were used as ADC at three landfills in 2019, seven percent less than 2018. As Figure 8 shows, ADC has used significant California waste tire amounts for many years, although lower than in the early 2000s. One landfill using tire ADC in 2019 is now closed, so 2020 use is expected to decline.

Figure 8
California Waste Tires Used as Landfill Alternative Daily Cover, 2003–2019[32]

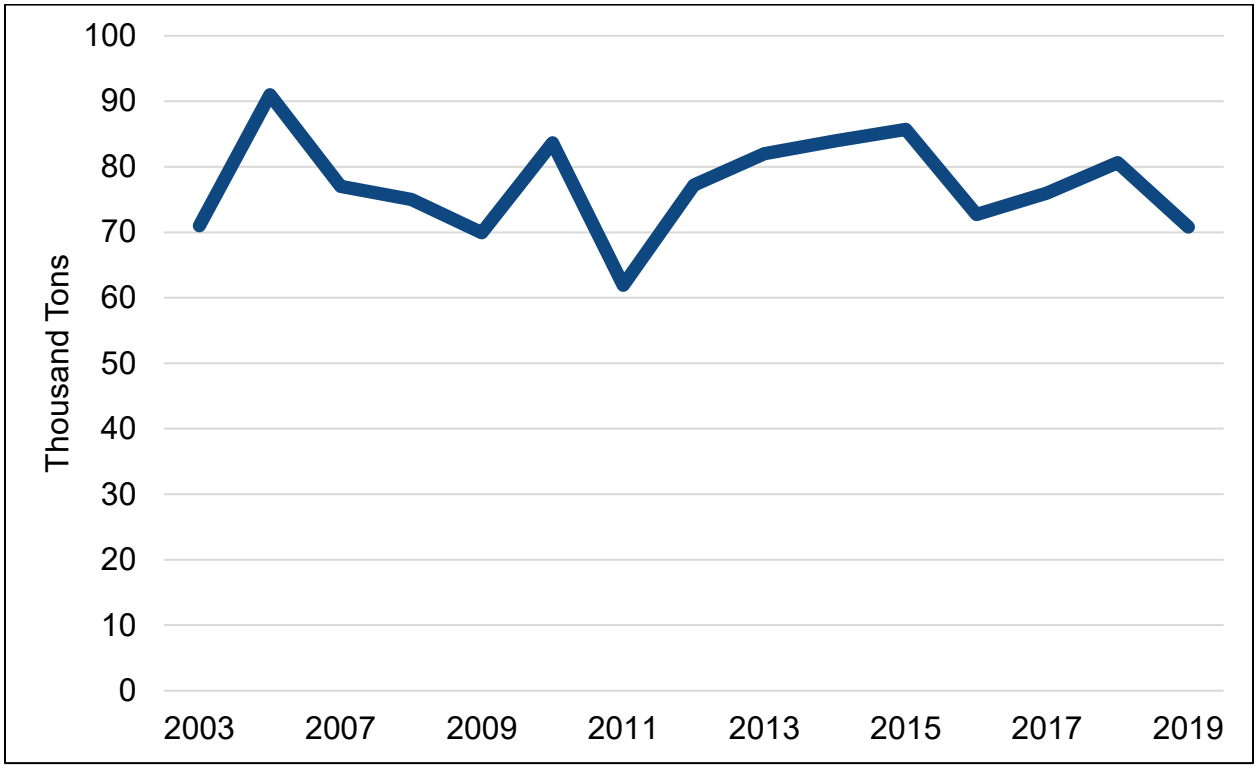


See Figure 8 source data in Appendix C.

4.6 Tire-Derived Fuel (In-State)

Four California cement kilns consumed an estimated 72,172 tons of whole waste tires and size reduced TDF as fuel in 2019, in addition to 8,900 tons (0.9 PTEs) of tire fiber derived as residual from California processing facilities. For consistency with reporting in prior years we report TDF separately from fiber residual used as fuel. As shown in Figure 9, TDF has been a strong and relatively stable market for many years, thriving without government support. (Statute precludes CalRecycle from promoting TDF.[33]) About 1,365 tons of the whole tire and size reduced TDF consumed was derived from out-of-state tires processed at California facilities, leaving 70,807 tons (7.0 million PTEs) of California-derived TDF and whole tires consumed, 12 percent less than in 2018. The drop is mainly due to one cement kiln that reported a significant reduction in TDF used, reportedly because of production limitations due to the comparatively longer burn time of TDF compared to alternative fuels. This facility said they expected to increase TDF use to historic levels in 2020, pending sufficient demand in the construction industry, so 2020 TDF consumption may increase over 2019. These cement kilns are already using TDF near their maximum potential, but surveys indicate a slight increase in 2020 is possible.

Figure 9
California Whole Waste Tires and TDF Consumed at Cement Kilns, 2003-2019[34]



See Figure 9 source data in Appendix C.

4.7 Imports and Exports

Used Tires and Casings

In 2019, used tire businesses exported an estimated 8,685 tons (0.9 million PTEs) of California-generated used tires. Additionally, large quantities of already culled used tires are also imported into California from other states either for sale here or further export. Each year, Mexico establishes a quota limiting the number of used tires imported from California, which on average in recent years has been about 750,000 tires.[35] Truck tire casings also flow into and out from California for retreading.

Waste Tire Imports and Exports

In 2019, an estimated 5,698 tons of whole waste tires (0.6 million PTEs) were imported from out of state and flowed to California processors. In turn, these processors shipped a variety of products derived from both California-generated and out-of-state tires to different market segments. The imported share of these shipments is excluded from the California tire use estimates presented in Table 1 and is presented in Table 2.

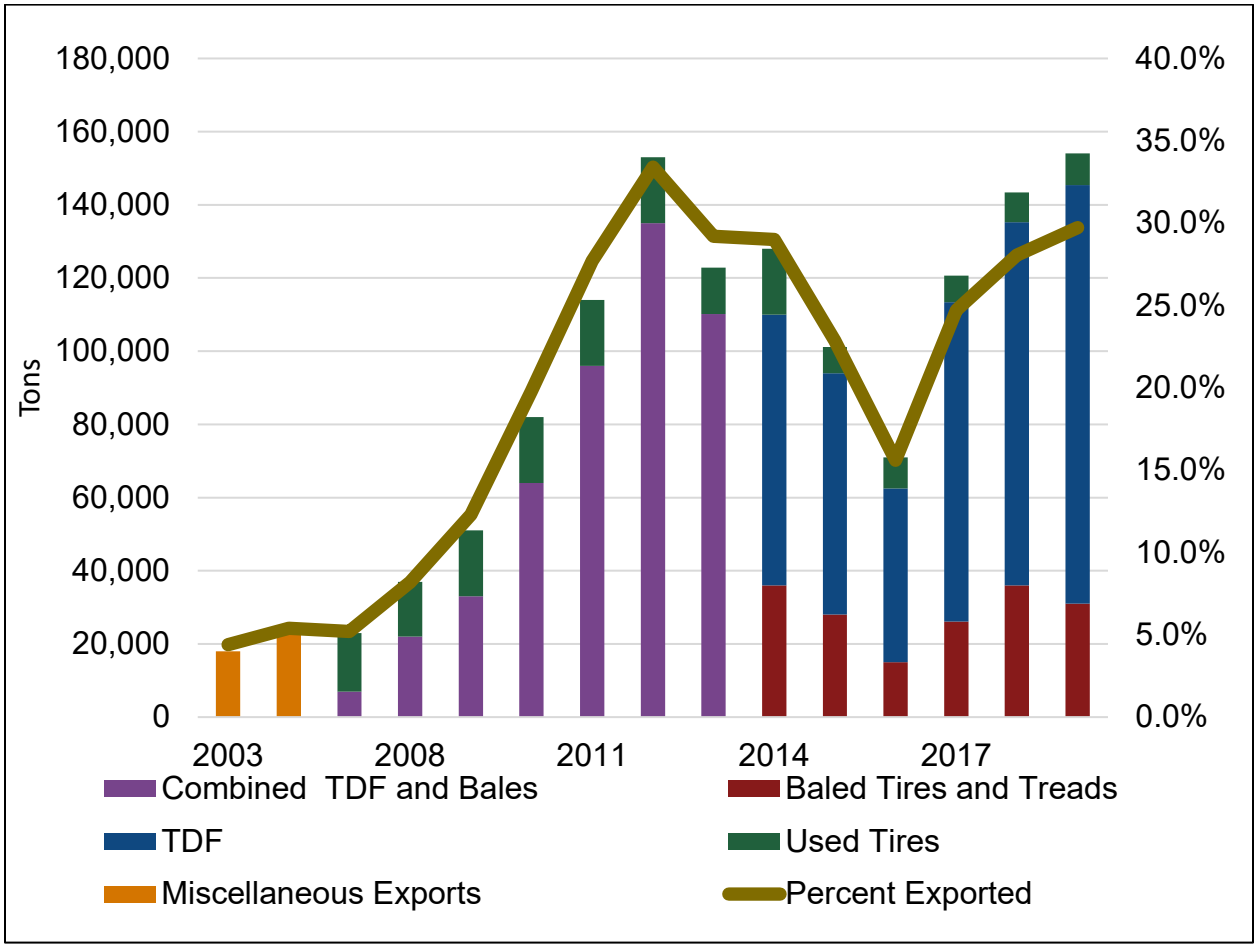
Table 2
Estimated Flows of Out-of-State Waste Tires Imported to California Processing Facilities (2019)

Sub-Category	Adjustments Made to Shipments from California Processors to Account for Imported Tires (Tons)
Retreads	NA
Used Tires (Exported)	177
Used Tires (Domestic)	520
Subtotal, Reuse	**697**
Crumb Rubber and Ground Rubber	**235**
Landfill TDA Uses	343
Non-Landfill TDA Uses	420
Subtotal, TDA	**764**
Other Recycling	0
Alternative Daily Cover	0
Tire-Derived Fuel Exports	1,956
Baled Tire and Tread Exports	0
Subtotal, Tire-Derived Fuel and Bale Exports	**1,956**
Tire-Derived Fuel (In-State)	1,365
Landfill Disposal	681
Total Imports Processed by California Facilities	**5,698**

Export of TDF and Baled Waste Tires

As shown in Figure 10, after initially spiking in 2012 at 135,000 tons (13.5 million PTEs), export of size reduced TDF and waste tire bales dropped steadily to 62,476 tons (6.3 million PTEs) in 2016, and has since rebounded sharply to exceed the 2012 peak. In 2019, an estimated 147,368 tons (14.7 million PTE) of two-inch minus to six-inch TDF and bales of waste tires and truck tire treads were exported by California firms. As with in-state TDF, a portion of this was derived from out-of-state tires flowing through California processors (1,956 tons or 0.2 million PTEs), resulting in an estimated net flow of 145,412 tons (14.5 million PTEs) of California-generated TDF and bales exported.

Figure 10
Export of Size Reduced TDF, Baled TDF and Used Tires, 2003-2019[36]



See Figure 10 source data in Appendix C.

An estimated 116,383 tons of size reduced TDF (11.6 million PTEs) was exported by California firms, primarily to Japan and Korea, or 114,427 tons (11.4 million PTE) after excluding the share of out-of-state tires processed at these California facilities. Pricing is reportedly less favorable than in recent years, with specifications tightening and competition from other exporting nations increasing. However, this market is expected to continue to consume large quantities of California waste tires at or near the same level as in 2019.

An estimated 30,985 tons of baled waste tires and treads (3.1 million PTEs) were exported in 2019, primarily to India. In early 2020, these imports into India were halted pending permit renewal. Due to this and the expected overall reduction in waste tire generation, the quantity of bales exported may decline markedly in 2020.

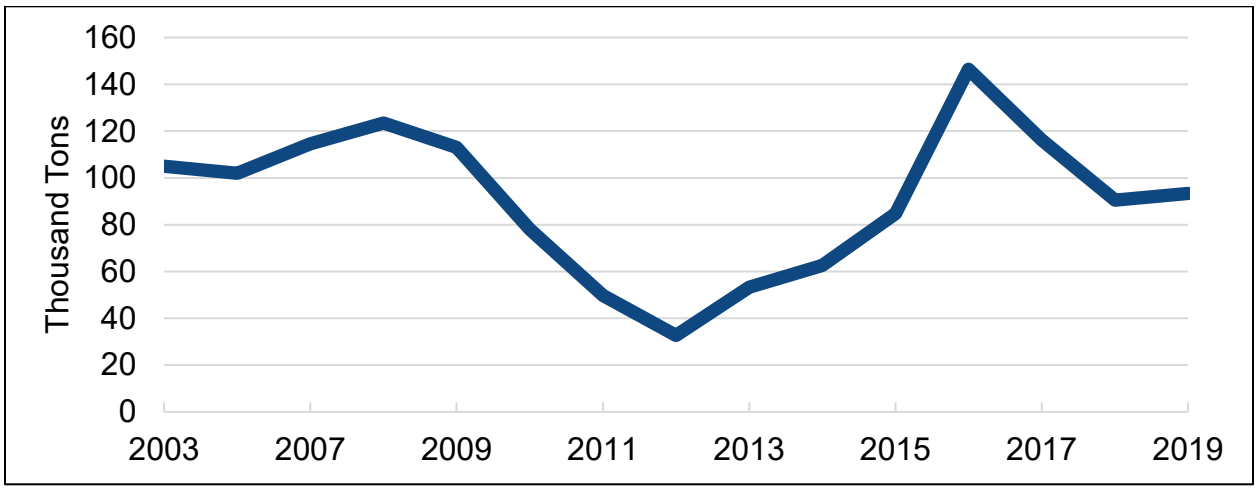
TDM and TDP Imports and Exports

As discussed in Section 4.3, we estimate significant quantities of TDM were imported into California in 2019. The reasons vary but may include established supplier relationships with contracted national accounts that may involve favorable, negotiated pricing (notwithstanding higher shipping costs), high across-the-board incentive payments to crumb rubber producers in certain jurisdictions, and lower operating costs in some out-of-state locations. Occasionally there may be temporary shortages of certain TDM specifications, for example, if demand for a certain TDM specification spikes and California suppliers are unable to adjust production in time to meet the demand. In one case, the TIP incentive aided in the decision for a manufacturer to shift from using an out-of-state supplier for a portion of their TDM needs to solely using an in-state supplier. All companies queried said they always use California-derived crumb rubber in CalRecycle funded projects. Some TDP manufacturers say low-cost products from China, Canada, or other out-of-state locations have captured market share. One asserted that while new tariffs have helped, Chinese imports sometimes are shipped via Canada to avoid tariffs.

4.8 Landfill Disposal

As shown in Figure 11, landfill disposal of California-generated waste tires has varied widely in recent years. In 2019, 93,433 tons (9.3 million PTEs) were disposed in landfills, three percent more than in 2018. The 2020 landfill disposal trend is difficult to predict. Declining bale exports in early 2020 increased landfill disposal. On the other hand, declining waste tire generation due to COVID-19 economic impacts combined with potentially strong diversion and recycling segments could reduce disposal, especially if the bale export market rebounds. However, waste tire flows are also dictated by geography and the priorities and capabilities of California processors.

Figure 11
California Waste Tire Landfill Disposal, 2003-2019[37]



See Figure 11 source data in Appendix C.

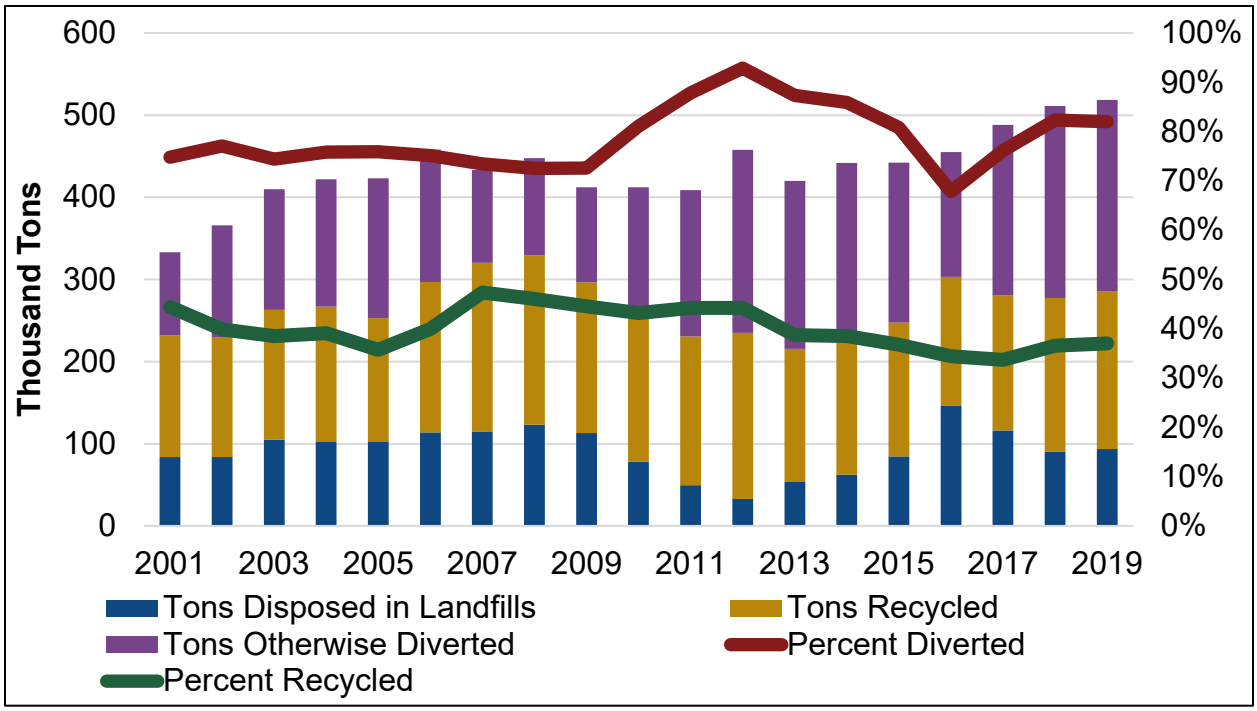
5. Diversion and Recycling Outlook

5.1 Historic Trends and Current Rates

California has an informal 75 percent recycling rate goal for all waste, including tires, by 2020 per AB 341 (Chesbro, Chapter 476, Statutes of 2011). While not codified in statute, CalRecycle has also informally adopted a 75 percent recycling goal specifically for waste tires. Consistent with AB 341, the recycling rate measurement excludes ADC and TDF (both exported TDF and domestic TDF sent to in-state cement kilns).

As shown in Figure 12, after steadily declining since 2007, the California waste tire recycling rate reversed this trend in 2018, increasing by nearly three full percentage points from 33.7 percent to 36.6 percent. In 2019, the recycling rate increased less than a percentage point and, after rounding, remained at 37 percent. However, the number of tons recycled was up about three percent at 191,917 tons (19.2 million PTEs).

Figure 12
Waste Tire Diversion and Landfill Disposal, 2001-2019[38]



See Figure 12 source data in Appendix C.

The waste tire diversion rate includes all uses other than landfill disposal (including both in-state and exported ADC and TDF). By this measure, after hitting an all-time high of 93 percent in 2012 with over 425,025 tons diverted, the diversion rate then fell for five straight years and hit an all-time low of 68 percent in 2016 with just over 308,738 tons

diverted. Total diversion then increased to 82 percent in each of the last two years, with a total of 424,919 tons (42.5 million PTEs) diverted in 2019.

5.2 The Short-Term Outlook in 2020

As discussed in Section 2, there is great uncertainty regarding how the COVID-19 pandemic crisis will play out in coming months and years, and how it will impact the pace of economic recovery in 2020 and beyond. While there is considerable uncertainty, it appears very likely that state and local government will be grappling with historically high budget deficits for at least the next two to three years, and that some funding mechanisms supporting waste tire management and recycling are likely to decline. This includes California's retail tire fee that funds CalRecycle's tire program as well as local and state infrastructure funding derived from consumer gas tax, sales tax, and bridge tolls. (See Section 2.3 for additional details.)

As summarized in Table 3, notwithstanding these trends it appears that while in 2020 overall waste tire generation may be down, it is possible that recycling tonnages could potentially hold steady or even increase. This could also be true for diversion markets such as in-state and exported TDF and waste tire bales, although bale exports may struggle to rebound after declining in early 2020. Uncertainty in the extent of decline in waste tire generation further complicates the 2020 diversion and recycling rate trend.

5.3 The Long-Term Outlook: Constraints to Expanding Tire Recycling

Several factors constrain growth in California waste tire recycling. Significant increases in tire recycling will depend on the extent to which industry, with CalRecycle support, can overcome these constraints and proactively invest to expand markets as well as TDM and TDP sales. Following is a synopsis of some of these key constraints.

Need for New and Expanded Markets

Current waste tire recycling markets such as paving, molded products, and civil engineering have room for growth and are being targeted by CalRecycle programs. But notwithstanding recent growth in molded products, positive trends in the paving market and periodic upticks in civil engineering, experience suggests this growth potential may be difficult to fully realize. Ideally, diverse new markets for TDM that are stable, sustainable, and profitable will emerge with the potential to consume very large quantities of California waste tires over many years.

TDP Competitiveness vs. Alternative Products

TDPs vary in their ability to succeed against competing, alternative products. In some cases, initial costs may be significantly higher, even if life-cycle costs are lower due to reduced maintenance or replacement costs. Purchasers may have low awareness of TDPs and their benefits or be unfamiliar with their use. TDPs may not have an established specification or track record. There may be a limited number of suppliers which deters soliciting multiple bids. Additionally, some out-of-state suppliers may be better positioned than California companies.

Table 3
The Short-Term 2020 Outlook for Diversion and Recycling

Category	2019 Tons	2019 Million PTEs	2019 % of Total	Outlook in 2020
Quantity of Tires Managed	518,353	51.8	100%	Decline, perhaps by roughly 10–15% due to the COVID-related temporary sharp decline in Spring 2020 and expected sustained economic recession.
Reuse	92,682	9.3	17.9%	Mixed but some decline appears likely. Used tire sales are strong but retreader volumes down in early 2020 due to reduced trucking activity related to COVID-19 impacts.
Crumb, Rubber and Ground Rubber	81,915	8.2	15.8%	Mixed but flat or slight growth possible in volumes. Despite current economic downturn, strong demand for paving, turf, molded, and ground rubber segments, though uncertain, may be close to 2019 levels.
Civil Engineering	13,330	1.3	2.6%	Projects on the books imply decline but uncertain timing and potential new projects in pipeline could result in amounts close to 2019 levels.
Other Recycling	3,991	0.4	0.8%	Roughly flat or slight growth. Expanded capacity in cut and stamped and other uses for large TDM materials.
Overall Recycling	191,917	19.2	37.0%	Uncertain. Recycled tonnage could be close to or slightly above 2019 levels. With expected lower waste tire generation recycling rate may rise.
ADC	16,784	1.7	3.2%	Decline. One ADC-using landfill closed in 2019.
TDF (In-State)	70,807	7.1	13.7%	Increase. Expected rebound after one cement kiln reduced use in 2019. Depends on adequate construction industry demand.
Export of TDF and Bales	145,412	14.5	28.1%	Possible decline. Strong demand for size reduced TDF continues, albeit with lower pricing and tighter specifications. Temporary halt to India bale imports and continued low bale pricing could reduce bale export volumes.
Overall Diversion	424,919	42.5	82.0%	Uncertain. Possible increase in diversion rate in best case scenario, especially if export markets rebound significantly.

TDP Expansion Requires Sustained Manufacturer Commitment & Investment

When a manufacturer launches a new product, enters a new market, or pursues feedstock conversion (i.e., replacing conventional virgin feedstock with TDM for established products), experience shows a sustained commitment and investment of time and money is typically required. Investment in new equipment or training for different processes may be required. This may impose opportunity costs, such as the need to temporarily reduce production of established product formulations while developing new ones or to forgo other investments into more established products. Manufacturers must also be able to secure sustainable sources of needed TDM feedstock that meets their required specifications at an acceptable price.

TDM Supplier Competition, Capabilities, and Priorities

Ideally, California TDM suppliers will expand production to meet any increases in demand using California generated waste tires. However, this requires, among other things, that these firms:

- Determine that the new opportunity is profitable and represents a desirable growth strategy for their company.
- Can secure adequate long-term supplies of whole waste tires or TDM for use as feedstock.
- Own and operate the equipment needed to produce the TDM feedstock specifications required by customers or are willing and able to make investments to acquire such equipment and can successfully compete to establish supplier relationships with mutually acceptable pricing and sales terms.

Pursuing new recycling market opportunities may pose risks and opportunity costs, and each firm must conduct its own due diligence to evaluate such opportunities. In some cases, these considerations may detract firms from pursuing certain new opportunities.

High Cost of Doing Business in California

California TDM feedstock suppliers and manufacturers often site the relatively high cost of doing business as a factor that can make it difficult to compete against some out-of-state firms or to make certain investment decisions. This includes the cost of land, building leases, labor (including the mandatory minimum hourly wage), workers compensation rates, permitting and environmental regulation, and utilities, among other things.

Access to Financing

As discussed in Section 2, the current economic downturn is increasing risk and uncertainty of new investments. But even in good times some tire recycling companies may have difficulty accessing capital or may be reticent to take on the risk, especially

where the proposed venture is not well proven or where TDM supplies, customers, and market demand is uncertain.

CalRecycle's waste tire market development programs are designed to address these constraints, as described in the final section below.

6. Concluding Remarks

California's waste tire management system has many strengths. It is well established and serves generators throughout the state, helping to ensure discarded tires are managed in a sound manner. Waste tire markets are very diverse. This helps ensure that there are options for keeping waste tires out of landfills, even when one or more markets may be disrupted. It also has led to a variety of different business models being adopted by waste tire processing facilities that have equipped themselves to produce different TDM specifications and products to serve customers in different market segments.

CalRecycle programs are aimed at making progress towards achieving the 75 percent recycling goal. As detailed in past Waste Tire Market Reports, approaching this level of recycling is not likely in the foreseeable future. It would require development of very robust new markets that have yet to be identified, combined with major investments in TDM and TDP capacity and broad shifts of waste tire supplies away from consistently profitable, well-established markets like in-state TDF. Since 2001, the annual amount of California waste tires recycled has fluctuated between 146,000 and 206,090 tons, and in 2019 was 191,917 tons. Reaching the 75 percent mark in 2020 would have required that just over 388,000 tons were recycled, more than twice the actual level.

CalRecycle has a long history of strategic waste tire market development approaches including research, demonstration projects, technical assistance, funding, and, in some cases, policies to encourage or require TDP use. These strategies helped to develop the TDF market in the early 1990s (prior to the statutory limitation on such activities[33]) and the strong asphalt rubber market. These strategies are also making progress with the molded and other product category and with civil engineering applications. CalRecycle continues to explore new alternative policies and approaches such as the Tire Incentive Program that launched in 2014.

This background—along with the challenges and uncertainty of the COVID-19 pandemic, the related economic downturn and expected reductions in CalRecycle, and other local and state funding levels—provide the context for updating CalRecycle's Five Year Tire Plan beginning in Fall 2020. As discussed in Section 2, the California Legislative Analyst's Office recently released its Spring Economic Outlook Report, framed around two scenarios: one "somewhat pessimistic" and one "somewhat optimistic." The challenge is to craft an approach that continues to safeguard California's TDP infrastructure and past gains in recycling and diversion, while positioning the state for success under either economic scenario.

Appendix A
Glossary of Key Terms and Acronyms

ADC: Alternative Daily Cover used at landfills instead of soil.

Buffings: Tire rubber produced as a by-product of the tire retreading process.

Caltrans: California Department of Transportation.

CARB: California Air Resources Board.

Comprehensive trip log (CTL): Paper or electronic forms used by haulers and waste tire facilities to document waste and used tire pickup or delivery transactions. Forms are submitted to CalRecycle and entered in the Waste Tire Manifest System database.

Crumb rubber: Tire-derived material less than ¼ inch in size, free of wire and fiber.

End-of-Life (EOL): Refers to products that have reached the end of their useful life and are ready to be discarded and managed, whether through reuse, recycling, landfill disposal, or another means.

Feedstock conversion: The process whereby a manufacturer of an existing, commercially proven product converts a portion of the raw materials (e.g., virgin rubber, plastic, or other materials) used to make a product to recycled materials, like crumb rubber made from recycled tires.

Ground rubber: Tire-derived material ¼ inch to 1 inch in size, sometimes referred to as nuggets.

OEHHA: California Office of Environmental Health Hazard Assessment.

Passenger tire equivalent (PTE): Defined as 20 pounds of tire rubber for the purpose of making consistent comparisons in this and other reports. (The actual weight of waste passenger tires may vary considerably.)

Retread tires: CalRecycle defines retreads as used tires (called “casings” in the retread industry) that have received a new tread.

Tire-derived aggregate (TDA): Tire-derived material used to replace conventional aggregates like rock in civil engineering applications.

Tire-derived fuel (TDF): Whole waste tires or tire-derived material consumed as fuel (referred to as size reduced TDF in this report).

Tire-derived material (TDM): Tires processed to meet market specifications, for example, crumb rubber, ground rubber, tire-derived aggregate, and tire-derived fuel.

Tire-derived product (TDP): Product made entirely or in part from tire-derived material.

Tire Incentive Program (TIP): A CalRecycle program launched in June 2015 to promote feedstock conversion and the use of crumb rubber as feedstock by California manufacturers.

Used Tire: 30 PRC § 42806.5 defines "used tire" as a tire that: a) is no longer mounted on a vehicle but is still suitable for use as a vehicle tire; b) meets applicable requirements of the Vehicle Code and Title 13 of the California Code of Regulations; and c) meets specified storage requirements.

Waste Tire Manifest System (WTMS): Waste Tire Management System. A CalRecycle database containing information on waste tire management firms, permits, and submitted comprehensive trip log data.

Waste Tire: 30 Public Resources Code (PRC) § 42807 defines a "waste tire" as a tire that is not mounted on a vehicle and is no longer suitable for use as a vehicle tire due to wear, damage, or deviation from manufacturer original specifications.

Appendix B
Methodology

B.1 Key Steps in the Approach

The primary goal of CalRecycle's annual waste tire market reports is to document how California generated waste and used tires are managed by estimating the quantity of tires and tire-derived material flowing to different market segments. This yields the data needed to calculate diversion and recycling rates, and by replicating the study annually an historical record is established. The reports also provide qualitative information on trends, barriers, and opportunities to help CalRecycle evaluate progress and consider program adjustments.

In short, the methodology involves the following steps:

Step 1: Update a list of key California facilities and companies involved in waste tire management, including processors, TDP manufacturers and installers, asphalt rubber blender operators, brokers, retreaders, cement kilns, and landfills accepting significant quantities of waste tire material for landfill disposal, ADC, or for civil engineering purposes.

Step 2: Gather data and information directly from these entities via direct surveys and interviews.

Step 3: Compile and analyze waste tire shipment data via CalRecycle's Waste Tire Manifest System database, which is derived from Comprehensive Trip Logs (CTLs) sent to CalRecycle by registered haulers. Also compile data from CalRecycle grant programs, permitting activity, and the Recycling and Disposal Reporting System.

Step 4: Review and compile information from third-party information sources such as Caltrans, the U.S. Tire Manufacturers Association, trade associations, and other online or published sources.

Step 4: Enter facility specific data from these sources into a customized spreadsheet model and systematically analyze flows to and from processing facilities and to end-use market segments. This is an iterative process in which researchers identify issues and follow up with facilities to refine and validate the analysis. The process continues until researchers believe that taking all available information sources into account, they have developed the most complete findings possible while avoiding double counting. In some cases, such as used tires that are culled from waste tire streams at several points in the supply chain, it is necessary to estimate a portion of flows that may otherwise be missed. All data are converted to tons during the analysis; however, findings are also reported in standard PTEs (i.e., defined as 20 pounds) to facilitate comparison with other reports.

The methodology has remained relatively unchanged since 2008; however, refinements are made from time to time. Refinements in this year's report include:

- Including source data used in all charts and figures and making other changes to satisfy new state policies on document accessibility.
- Renaming Waste Tire Bales as Waste Tire Bales and Treads to include reference to treads, which are now also baled and exported for use as fuel.

B.2 Interpreting Study Findings

Readers should consider the following when using this report's findings:

Findings Quantify Use of California-Generated Waste Tires

The main findings on flows of California waste tires to different market segments exclude imported waste tires, tire-derived materials, and tire-derived products, as well as buffings from retread operations. Consequently, the findings do not estimate total market size. Also, when out-of-state waste tires are received by a California processor, the share of outputs to different market segments is reduced proportionately to not over-state use of California-generated tires.

Tire Recycling and Diversion Rates Are Not Adjusted for Residuals or Disposed TDPs

As in most tire studies, diversion and recycling rates are not adjusted for the relatively small amount of steel and fiber residuals generated by TDM producers that is disposed in landfills. In California, most of the steel is recycled, and most fiber is combusted at California cement kilns. Also, most TDPs are currently disposed at the end of their useful life, but rates are not adjusted to reflect this common practice.

Reasonably Accurate Trend Information

The authors strive to develop the most complete and accurate estimates for each market segment possible, while avoiding double counting. Notwithstanding various data gaps, data quality issues, conversion factor issues, and the need to reconcile conflicting sources of information, the authors believe this report provides reasonably accurate information that can be used to evaluate trends over time.

Appendix C
Accessibility Notes and Source Data

Table C-1

Source Data for Figure 1 California Waste Tire Flows, 2019

Category	Million PTE	Percent of Total
Used Tires (Domestic and Export)	4.5	8.6%
Retreads	4.8	9.2%
Crumb Rubber and Ground Rubber	8.2	15.8%
Civil Engineering	1.3	2.6%
TDF Exports	11.4	22.1%
Baled Tire and Tread Exports	3.1	6.0%
TDF (In-State)	7.1	13.7%
ADC	1.7	3.2%
Landfill Disposal	9.3	18.0%
Other Recycling	0.4	0.8%
Total	**51.8**	**100.0%**

Table C-2

Source Data for Figure 2 Historical Waste Tire Recycling, Diversion and Landfill Disposal Trend, 2001 – 2019 Error! Bookmark not defined.

Year	Tons Disposed in Landfills	Tons Recycled	Tons Otherwise Diverted	Percent Diverted	Percent Recycled
2001	84,000	148,000	101,000	74.8%	44.4%
2002	84,000	146,000	136,000	77.0%	39.9%
2003	105,000	158,000	147,000	74.4%	38.5%
2004	102,000	165,000	155,000	75.8%	39.1%
2005	102,000	151,000	170,000	75.9%	35.7%
2006	114,000	183,000	161,000	75.1%	40.0%
2007	115,000	205,230	113,150	73.5%	47.4%
2008	123,000	206,090	118,390	72.5%	46.1%
2009	113,046	183,629	115,681	72.6%	44.5%
2010	77,993	178,029	156,093	81.1%	43.2%
2011	49,700	180,896	178,236	87.8%	44.2%
2012	32,688	202,330	222,695	92.9%	44.2%
2013	53,320	162,263	204,451	87.3%	38.7%
2014	62,579	170,138	209,189	85.9%	38.5%
2015	84,699	162,680	194,978	80.9%	36.8%
2016	146,429	156,741	151,997	67.8%	34.4%
2017	116,214	164,438	207,502	76.2%	33.7%
2018	90,508	186,939	233,814	82.3%	36.6%
2019	93,433	191,917	233,003	82.0%	37.0%

Accessibility Notes for Figure 3, California Waste Tire Recycling Industry Flow Chart

This chart illustrates how California waste tires, tire-derived material (TDM) and tire-derived products (TDPs) flow between various entities. Haulers pick up waste tires from generators and may deliver them to either: a landfill for disposal; a processor (who may produce TDM); a used tire buyer or seller; or a TDF consumer (i.e., one of four California cement kilns). Processors may send tires or TDM to a landfill for disposal, use in civil engineering projects or other beneficial uses, a used tire buyer or seller, an exporter, a TDP manufacturer or installer, a TDF consumer, or a civil engineering project. Imports into and exports from California include: TDM and TDPs, retread tires and buffings, used tires, tire-derived fuel, baled waste tires and truck tire treads, and whole waste tires. Such imports may flow to California processors, TDP manufacturers

and installers, TDF consumers, or directly to customers. Such exports may flow from California processors, TDP manufacturers, used tire buyer and sellers, and retreaders. There are several categories of manufacturers and installers including:

- Accessibility ramps
- Roofing
- Flooring
- Landscape surfaces
- Mats, pavers, and tiles
- Traffic safety
- Equestrian applications
- Pavements
- Synthetic turf infill
- Playground surfaces
- Paths, walkways, and sidewalks
- And many more

Types of civil engineering applications include:

- Landfill projects
- Light-weight fill
- Retaining wall backfill
- Vibration dampening
- Storm water management

Finally, TDP manufacturers and installers, civil engineering project leads, and TDF consumers sell products directly to their customers, inside and outside of California.

Table C-3A

Source Data for Figure 4 Historical Market Trends by Segment, 2003 – 2007 Error! Bookmark not defined.

Category	2003	2004	2005	2006	2007
Landfill Disposal	105,000	102,000	102,000	114,000	114,510
ADC	49,000	45,000	47,000	45,000	28,200
Exported TDF and Bales	18,000	31,000	23,000	19,000	7,000
In-State TDF	71,000	81,000	91,000	83,000	77,000
Other Recycling	27,000	29,000	32,000	33,000	950
Civil Engineering	18,000	12,000	20,000	33,000	35,340
Crumb Rubber and Ground Rubber	60,000	62,000	52,000	66,000	92,130
Reuse	62,000	60,000	56,000	65,000	78,000
Total Managed	410,000	422,000	423,000	458,000	433,000

Table C-3B

Source Data for Figure 4 Historical Market Trends by Segment, 2008-2013 Error! Bookmark not defined.

Category	2008	2009	2010	2011	2012	2013
Landfill Disposal	123,490	113,046	77,993	49,700	32,688	53,320
ADC	20,580	12,042	7,928	19,589	10,486	12,316
Exported TDF and Bales	22,000	33,000	64,000	96,000	135,000	110,000
In-State TDF	75,020	69,926	83,675	61,911	77,209	81,982
Other Recycling	790	713	490	735	0	152
Civil Engineering	27,890	17,510	18,274	5,915	5,844	4,557
Crumb Rubber and Ground Rubber	100,510	84,614	85,521	88,135	105,200	79,038
Reuse	78,000	82,000	74,000	87,000	91,000	78,635
Total Managed	448,000	412,000	411,000	408,000	458,000	420,000

Table C-3C

Source Data for Figure 4 Historical Market Trends by Segment, 2014 - 2019 Error! Bookmark not defined.

Category	2014	20015	2016	2017	2018	2019
Landfill Disposal	62,579	84,699	146,429	116,214	90,508	93,433
ADC	14,691	15,217	16,798	18,108	17,975	16,784
Exported TDF and Bales	110,404	94,040	62,476	113,405	135,236	145,412
In-State TDF	83,934	85,721	72,723	75,989	80,603	70,807
Other Recycling	564	533	0	76	3,455	3,991
Civil Engineering	12,632	11,668	10,961	6,436	5,127	13,330
Crumb Rubber and Ground Rubber	72,887	76,195	64,408	68,142	87,740	81,915
Reuse	84,619	74,285	81,373	89,784	90,617	92,682
Total Managed	442,311	442,358	455,168	488,153	511,262	**518,353**

Table C-4

Source Data for Figure 5 California Waste Tire Reuse, 2003-2019 Error! Bookmark not defined.

Year	Used Tires (Domestic)	Used Tires (Export)	Total Used Tires (Tons)	Retreads (Tons)	Total Reuse (Tons)
2003	18,000	NA	18,000	44,000	62,000
2004	16,000	NA	16,000	44,000	60,000
2005	12,000	NA	12,000	44,000	56,000
2006	21,000	NA	21,000	44,000	65,000
2007	18,000	16,000	33,800	44,000	78,000
2008	19,000	15,000	33,600	44,200	78,000
2009	20,000	18,000	37,266	44,000	82,000
2010	20,000	18,000	37,942	36,018	74,000
2011	28,195	17,627	45,823	40,651	87,000
2012	33,448	18,230	51,678	39,838	91,000
2013	25,355	12,678	38,033	40,635	78,635
2014	24,336	17,943	42,278	42,341	84,619
2015	23,800	7,128	30,927	43,358	74,285
2016	30,510	8,522	39,032	42,341	81,373
2017	34,174	7,202	41,375	48,409	89,784
2018	34,512	8,180	42,692	47,925	90,617
2019	34,235	8,013	44,757	47,925	92,682

Table C-5

Source Data for Figure 5 California Waste Tires Used to Produce Crumb/Ground Rubber, 2003-2019 Error! Bookmark not defined.

Year	Paving (Tons)	Turf Infill (Tons)	Ground Rubber (Tons)	Molded and Other (Tons)	Total Crumb and Ground Rubber (Tons)
2003	26,000	NA	NA	NA	60,000
2004	27,000	NA	NA	NA	62,000
2005	20,000	NA	NA	NA	52,000
2006	39,000	NA	NA	NA	66,000
2007	39,200	24,900	9,500	18,500	92,100
2008	43,200	24,400	11,500	21,400	100,500
2009	46,400	13,420	12,897	11,897	84,614
2010	50,307	13,724	11,047	10,443	85,521
2011	48,629	16,958	10,611	11,937	88,135
2012	51,600	21,552	17,700	13,931	105,244
2013	35,422	20,040	14,175	9,401	79,038
2014	34,708	16,821	11,404	9,953	72,887
2015	38,736	18,686	12,144	6,629	76,195
2016	NA	NA	NA	NA	64,408
2017	NA	NA	NA	NA	68,142
2018	NA	NA	NA	NA	87,740
2019	NA	NA	NA	NA	81,915

Table C-6

Source Data for Figure 6 California Waste Tires Used in Civil Engineering, 2003-2019 Error! Bookmark not defined.

Year	Landfill CE (Tons)	Non-Landfill CE (Tons)	Total Civil Engineering (Tons)
2003	NA	NA	18,000
2004	NA	NA	12,000
2005	NA	NA	20,000
2006	NA	NA	33,000
2007	25,500	9,800	35,340
2008	20,600	73	27,890
2009	13,975	3,535	17,510
2010	17,924	350	18,274
2011	5,915	0	5,915
2012	5,844	0	5,844
2013	2,612	1,945	4,557
2014	8,806	3,826	12,632
2015	10,374	1,294	11,668
2016	7,083	3,878	10,961
2017	5,583	853	6,431
2018	4,021	1,106	5,127
2019	6,682	6,648	13,330

Table C-7

Source Data for Figure 7 California Waste Tires Used as Landfill Alternative Daily Cover, 2003-2019 Error! Bookmark not defined.

Year	ADC (Tons)
2003	49,000
2004	45,000
2005	47,000
2006	45,000
2007	28,200
2008	20,580
2009	12,042
2010	7,928
2011	19,589
2012	10,486
2013	12,316
2014	14,691
2015	15,217
2016	16,798
2017	18,108
2018	17,975
2019	16,784

Table C-8

Source Data for Figure 8 California Waste Tires Consumed at In-State Cement Kilns, 2003-2019 Error! Bookmark not defined.

Year	In-State TDF (Tons)
2003	71,000
2004	81,000
2005	91,000
2006	83,000
2007	77,000
2008	75,020
2009	69,926
2010	83,675
2011	61,911
2012	77,209
2013	81,982
2014	83,934
2015	85,721
2016	72,723
2017	75,989
2018	80,603
2019	70,807

Table C-9

Source Data for Figure 9 Export of Size Reduced TDF, Baled TDF and Used Tires, 2003-2019 Error! Bookmark not defined.

Year	Combined TDF and Bales	Baled Tires and Treads	TDF	Used Tires	Miscellaneous Exports	Percent Exported
2003	NA	NA	NA	NA	18,000	4.4%
2004	NA	NA	NA	NA	31,000	7.3%
2005	NA	NA	NA	NA	23,000	5.4%
2006	NA	NA	NA	NA	19,000	4.3%
2007	7,000	NA	NA	16,000	NA	5.2%
2008	22,000	NA	NA	15,000	NA	8.2%
2009	33,000	NA	NA	18,000	NA	12.3%
2010	64,000	NA	NA	18,000	NA	19.8%
2011	96,000	NA	NA	18,000	NA	27.7%
2012	135,000	NA	NA	18,000	NA	33.4%
2013	110,144	NA	NA	12,678	NA	29.2%
2014	NA	36,000	74,000	18,000	NA	29.0%
2015	NA	28,000	66,000	7,128	NA	22.9%
2016	NA	15,000	47,476	8,522	NA	15.6%
2017	NA	26,089	87,317	7,202	NA	24.7%
2018	NA	36,039	99,197	8,180	NA	28.1%
2019	NA	30,985	114,427	8,685	NA	29.7%

Table C-10

Source Data for Figure 10 California Waste Tire Landfill Disposal, 2003-2019 Error! Bookmark not defined.

Year	Landfill Disposal (Tons)
2003	105,000
2004	102,000
2005	102,000
2006	114,000
2007	114,510
2008	123,490
2009	113,046
2010	77,993
2011	49,700
2012	32,688
2013	53,320
2014	62,579
2015	84,699
2016	146,429
2017	116,214
2018	90,508
2019	93,433

Table C-11

Source Data for Figure 11 Waste Tire Diversion and Landfill Disposal, 2001-2019 Error! Bookmark not defined.

Year	Tons Disposed	Tons Recycled	Tons Otherwise Diverted	Percent Diverted	Percent Recycled
2001	84,000	148,000	101,000	74.8%	44.4%
2002	84,000	146,000	136,000	77.0%	39.9%
2003	105,000	158,000	147,000	74.4%	38.5%
2004	102,000	165,000	155,000	75.8%	39.1%
2005	102,000	151,000	170,000	75.9%	35.7%
2006	114,000	183,000	161,000	75.1%	40.0%
2007	115,000	205,230	113,150	73.5%	47.4%
2008	123,000	206,090	118,390	72.5%	46.1%
2009	113,046	183,629	115,681	72.6%	44.5%
2010	77,993	178,029	156,093	81.1%	43.2%
2011	49,700	180,896	178,236	87.8%	44.2%
2012	32,688	202,330	222,695	92.9%	44.2%
2013	53,320	162,263	204,451	87.3%	38.7%
2014	62,579	170,138	209,189	85.9%	38.5%
2015	84,699	162,680	194,978	80.9%	36.8%
2016	146,429	156,741	151,997	67.8%	34.4%
2017	116,214	164,438	207,502	76.2%	33.7%
2018	90,508	186,939	233,814	82.3%	36.6%
2019	93,433	191,917	233,003	82.0%	37.0%

End Notes

[1] Historical California waste tire market data are from two sources.

Data covering 2002–2006: California Department of Resources Recycling and Recovery (CalRecycle), Annual California Waste Tire Generation, Markets, and Disposal Reports, Sacramento, Prepared by CalRecycle Staff and published annually through 2006.

Data covering 2007–present: California Department of Resources Recycling and Recovery (CalRecycle), Annual California Waste Tire Market Reports, Sacramento, Prepared by CalRecycle Contractors. Methodologies are periodically updated as described in each annual report.

These annual reports are available on CalRecycle's Tire Publications Web Page.

[2] California Legislative Analyst Office, *The 2020-21 Budget: California's Spring Fiscal Outlook*, Page 1, Sacramento, May 8, 2020, https://lao.ca.gov/Publications/Report/4228.

[3] Information on CalRecycle tire related grants and other support programs is available on the CalRecycle Tire Recycling, Cleanup, and Enforcement Grants webpage.

New policies aimed at streamlining and increasing the effectiveness of the rubberized pavement and TDA grant programs were announced at the June 16, 2020 CalRecycle Public Meeting.

[4] "COVID-19 Official California State Government Website," California Department of Health, accessed **Error! Hyperlink reference not valid.**June 17, 2020, https://COVID19.ca.gov/.

[5] "Essential Workforce," Official California State Government Website, accessed June 8, 2020, https://COVID19.ca.gov/essential-workforce/.

[6] See end note 2.

[7] "California unemployment rate rose to record 15.5 percent in April," California Employment Development Department, accessed June 11, 2020,**Error! Hyperlink reference not valid.** https://edd.ca.gov/newsroom/unemployment-may-2020.htm.

[8] "Report 400 C Monthly Labor Force Data for Counties, Preliminary June Data," California Employment Development Department accessed July 31, 2020, https://www.labormarketinfo.edd.ca.gov/data/unemployment-and-labor-force.html.

[9] "Consumer Spending," U.S. Bureau of Economic Analysis Website, accessed June 10, 2020,**Error! Hyperlink reference not valid.** https://www.bea.gov/data/consumer-spending/main.

[10] "Federal Reserve issues FOMC statement," Press Release by the Board of Governors of the Federal Reserve System, accessed June 10, 2020, https://www.federalreserve.gov/newsevents/pressreleases/monetary20200610a.htm.

[11] Goodman, Jenn, "Architectural Billings Continue Historic Decline," *Construction Dive*, May 20, 2020, https://www.constructiondive.com/news/aia-index-points-to-major-downturn-in-commercial-construction/576605/.

[12] "ATA Truck Tonnage Index Plunged 12.2%" in April," American Trucking Association Press Release, May 9, 2020, https://www.trucking.org/news-insights/ata-truck-tonnage-index-plunged-122-april.

[13] "California Statewide Crude Oil Price Index," State Of California, Department Of Transportation, Division Of Construction Website, accessed June 17, 2020,**Error! Hyperlink reference not valid.** https://dot.ca.gov/programs/construction/california-statewide-crude-oil-price-index.

[14] See end note 2.

[15] "USTMA Provides Adjusted 2020 Tire Shipment Forecast Amid COVID-19 Pandemic," U.S. Tire Manufacturers Association, Press Release accessed June 4, 2020, https://www.ustires.org/newsletter/press-releases.

[16] California Public Resources Code, Section 42885, http://leginfo.legislature.ca.gov/faces/codes_displayText.xhtml?lawCode=PRC&division=30.&title=&part=3.&chapter=17.&article=5.

[17] Goodman, Jenn, "California Transit, Road Work to Continue Despite $54B State Budget Deficit," *Construction Dive*, May 15, 2020, accessed June 10, 2020, https://www.constructiondive.com/news/california-transit-road-work-to-continue-despite-54b-state-budget-deficit/578029/.

[18] "Rapidly Changing Events Caused by the COVID-19 Pandemic Challenged the Asphalt Paving Industry in California," *California Asphalt Magazine*, *2020 Pavement Preservation Issue,* Page 23, California Asphalt Pavement Association, https://issuu.com/calcontractor/docs/cam_pavement_preservation_2020_-_issuu?fr=sMTIzNjkzODQ0MQ.

[19] Stevens, David, Tire Retread Information Bureau, "U.S. Retread Market and Ways Forward for the U.S. Retread Industry," PowerPoint Presentation, CalRecycle Tire Conference, August 29, 2018.

[20] See end note 1.

[21] "These New Chinese Truck Tire Tariffs Are Effective Immediately," *Modern Tire Dealer*, February 15, 2019. Accessed online on June 7, 2020 here.

https://www.moderntiredealer.com/37504/these-new-chinese-truck-tire-tariffs-are-effective-immediately

[22] Institute for Regional Studies of the Californias, San Diego State University, *The Flow of Used Tires from California to Mexico and Waste Tire Disposal Issues in Baja California and the Adjacent Area of Sonora*, November 5, 2017, Page 3, https://www2.calrecycle.ca.gov/Publications/Details/1620.

[23] See end note 1.

[24] California State Transportation Agency, *2017 Annual Report on Caltrans' Use of Waste and Used Tires*, https://dot.ca.gov/-/media/dot-media/programs/maintenance/documents/2017crumbrubberreportadacompliant.pdf.

[25] See end note 3.

[26] "How Long Can a Synthetic Turf Field Be Used," Synthetic Turf Council Website, Accessed online on June 18, 2020, https://www.syntheticturfcouncil.org/page/FAQs.

[27] "Synthetic Turf Studies." California Office of Environmental Health Hazard Assessment Website, accessed June 10, 2020,**Error! Hyperlink reference not valid.** https://oehha.ca.gov/risk-assessment/synthetic-turf-studies.

[28] "Federal Research on Recycled Tire Crumb Used on Playing Fields," U.S. Environmental Protection Agency Website, accessed June 10, 2020,**Error! Hyperlink reference not valid.** https://www.epa.gov/chemical-research/federal-research-recycled-tire-crumb-used-playing-fields.

[29] See end note 3.

[30] See end note 1.

[31] See end note 3.

[32] See end note 1.

[33] California Public Resources Code 42873(b)(1) states, "The board may not expend funds for an activity that provides support or research for the incineration of tires. For the purposes of this article, incineration of tires, includes, but is not limited to, fuel feed system development, fuel sizing analysis, and capacity and production optimization."

[34] See end note 1.

[35] See end note 22.

[36] See end note 1.

[37] See end note 1.

[38] See end note 1.