California Energy Commission

Draft Environmental Impact Report

Replacement Tire Efficiency Program

April 2026
Docket Number 24-TIRE-01 | CEC-600-2026-013
State Clearinghouse Number 2024090611

Contents

List of Acronyms ..... **v**

Summary **1**

S.1 Project Description Summary 1
S.2 Summary of Environmental Impacts 2
S.3 Summary of Known Areas of Controversy 6
S.4 Summary of Issues to be Resolved 6

1 Introduction **1-1**

1.1 Purpose and Intended Use of this EIR 1-1
1.2 Scope of the EIR 1-1
1.3 Agency Roles and Responsibilities 1-3
1.4 CEQA Public Review Process 1-3

1.4.1 Notice of Preparation 1-3
1.4.2 Draft EIR 1-6
1.4.3 Final EIR 1-7

1.5 Organization of this EIR 1-8

2 Project Description **2-1**

2.1 Project Location 2-1
2.2 Statement of Project Objectives 2-1
2.3 Legislative and Policy Background 2-3

2.3.1 Federal 2-3
2.3.2 State 2-4

2.4 Project Characteristics 2-6

2.4.1 Regulatory Framework 2-8
2.4.2 Applicability of Proposed Regulations 2-8
2.4.3 Manufacturer Reporting Requirements 2-12
2.4.4 Testing Procedures 2-12
2.4.5 Database 2-13

2.5 Feasibility 2-13

2.5.1 Feasibility of Proposed Tire Efficiency Standards 2-13
2.5.2 Safety Considerations 2-14
2.5.3 Tire Life and Durability 2-15
2.5.4 Achievement Methods 2-16

2.6 Intended Uses of This EIR 2-17
2.7 References 2-17

3 Environmental Setting, Impacts, and Mitigation 3-1

3.1 Utilities and Service Systems: Solid Waste 3-8

3.1.1 Environmental Setting 3-8
3.1.2 Regulatory Setting 3-13
3.1.3 Environmental Impacts 3-15

3.2 Hazardous Materials 3-19

3.2.1 Environmental Setting 3-19
3.2.2 Regulatory Setting 3-32
3.2.3 Environmental Impacts 3-34

3.3 Air Quality 3-38

3.3.1 Environmental Setting 3-39
3.3.2 Regulatory Setting 3-44
3.3.3 Environmental Impacts 3-45

3.4 Biological Resources 3-46

3.4.1 Environmental Setting 3-46
3.4.2 Regulatory Setting 3-50
3.4.3 Environmental Impacts 3-51

3.5 Environmental Benefits 3-66
3.6 References 3-68

3.6.1 Utilities and Service Systems: Solid Waste 3-68
3.6.2 Hazardous Materials 3-69
3.6.3 Air Quality 3-74
3.6.4 Biological Resources 3-75
3.6.5 Environmental Benefits 3-88

4 Other Discussions 4-1

4.1 Significant Irreversible Environmental Changes Caused by Project Implementation 4-1
4.2 Growth-Inducing Impacts 4-2
4.3 Environmental Justice 4-3

4.3.1 Environmental Setting and Regulatory Background 4-3
4.3.2 Environmental Considerations 4-8

4.4 Mandatory Findings of Significance 4-8
4.5 References 4-11

5 Alternatives 5-1

5.1 Introduction 5-1
5.2 CEQA Requirements 5-1
5.3 Project Objectives and Alternatives Screening 5-2
5.4 Alternatives Selected for Analysis 5-4

5.4.1 No Project Alternative 5-4
5.4.2 Alternative 1: More Stringent Minimum Performance Standard 5-5
5.4.3 Alternative 2: Less Stringent Minimum Performance Standard 5-9

5.5 Alternatives Considered and Not Evaluated Further 5-13

5.5.1 Consumer Information Program Only 5-13
5.5.2 Tire Efficiency Rating System Only 5-13
5.5.3 Delay Program Implementation 5-14

5.6 Environmentally Superior Alternative 5-14
5.7 References 5-16

6 Organizations/Persons Consulted and Preparers/Reviewers 6-1

6.1 Organizations and Persons Consulted in the Preparation of the EIR 6-1

6.1.1 Organizations 6-1

6.2 EIR Preparers and Reviewers 6-1

6.2.1 California Energy Commission 6-1
6.2.2 Aspen Environmental Group 6-1

APPENDIX A: Replacement Tire Efficiency Program Initial Study

APPENDIX B: Notice of Preparation

APPENDIX C: Scoping Comments

APPENDIX D: Rolling Resistance and Tire Technology

APPENDIX E: Waste Tire Disposal in California

Tables

Table S-1: Summary of Environmental Impacts 5
Table 1-1. Summary of Scoping Comments 1-4
Table 2-1: Key Regulation Components 2-6
Table 2-2: RRC Minimum Performance Standard by Replacement Tire Type 2-7
Table 2-3: Proposed California Tire Efficiency Rating System 2-7
Table 3.1-1: The Outlook for California Waste Tire Recycling 3-13

Table 3.3-1: California NOx Emissions Inventory (tons per day) 3-40
Table 3.3-2: California PM2.5 Emissions Inventory (tons per day) 3-41
Table 4-1. Components that Form the CalEnviroScreen 4.0 Score 4-5
Table 5-1: Key Regulation Components 5-3
Table 5-2: Replacement Tire Efficiency Minimum Performance Standard (RRC) 5-3
Table 5-3: Benefits Comparison of Alternative 1 and Proposed Project 5-5
Table 5-4: Benefits Comparison of Alternative 2 and Proposed Project 5-9

Figures

Figure 2-1: CEC Tire Test Program Results of RRC vs. Cost 2-14
Figure 2-2: RRC vs. Wet Grip Index 2-15
Figure 4-1: CalEnviroScreen SB 535 Disadvantaged Communities 4-7

List of Acronyms

6PPD	N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine
6PPD-Q	6PPD-quinone
AB	Assembly Bill
ADC	Alternative daily cover
APS	Alternative Planning Strategy
BHT	Butylated hydroxytoluene
BTH	Benzothiazole
BTs	Benzothiazole and its derivatives
CAA	Clean Air Act
CAFE	Corporate Average Fuel Economy
CalEPA	California Environmental Protection Agency
CalSTA	California State Transportation Agency
CARB	California Air Resources Board
CBC	California Building Code
CCR	California Codes of Regulation
CDFW	California Department of Fish and Wildlife
CFGC	California Fish and Game Code
CEC	California Energy Commission
CEQA	California Environmental Quality Act
CESA	California Endangered Species Act
CFR	Code of Federal Regulations
CGS	California Geological Survey
CIWMB	California Integrated Waste Management Board
CMP	Congestion management process
CMR	Carcinogenic, mutagenic, and reproductive
CNDDB	California Natural Diversity Database
CO	Carbon monoxide
CO_2	Carbon dioxide
CO_2e	Carbon dioxide equivalent
COVID-19	Coronavirus disease of 2019
CPs	Chlorinated paraffins
CTC	California Transportation Commission
CTP	California Transportation Plan
CWA	Clean Water Act
DAC	Disadvantaged Community
DOT	Department of Transportation
DPG	Diphenylguanidine

DPM	Diesel particulate matter
DPPD	*N,N'*-diphenyl-*p*-phenylenediamine
DPPD-Q	*N,N'*-diphenyl-*p*-phenylenediamine-quinone
DTSC	Department of Toxic Substances Control
EIR	Environmental impact report
EISA	Energy Independence and Security Act of 2007
EO	Executive Order
EPA	Environmental Protection Agency
EPCA	Energy Policy and Conservation Act
ESA	Endangered Species Act
EU	European Union
EV	Electric vehicle
FHSZ	Fire Hazard Severity Zones
FHWA	Federal Highway Administration
FRAP	Federal Research Action Plan
GHG	Greenhouse gas
GVWR	Gross vehicle weight rating
GW-540	Tris(nonylphenyl) phosphate (TNP), tris(1,2,2,6,6-pentamethylpiperidinyl) phosphite
HAP	Hazardous air pollutant
HMMM	Hexamethoxymethylmelamine
HMPE	Hexamethylolmelamine pentamethyl ether
HPV	High Production Volume
HSC	Health and Safety Code
HWCL	Hazardous Waste Control Law
ICBA	International Carbon Black Association
ICE	Internal combustion engine
Irgafos168	Tris(2,4-di-tert-butylphenyl) phosphite
IOCA	International Organization of Motor Vehicle Manufacturers
ISO	International Organization for Standardization
JAEDI	Justice Access Equity Diversity Inclusion
kg	Kilogram
kg/year	Kilograms per year
LCCPs	Long-chained chlorinated paraffins
LOS	Level of Service
LRA	Local Responsibility Areas
MACT	Maximum achievable control technology
MB	2-mercaptobenzimidazole
MBT	2-mercaptobenzothiazole

MBZ	2-mercaptobenzimidazole zinc salt
MCCPs	Medium-chained chlorinated paraffins
MMT	Million metric tons
MPOs	Metropolitan Planning Organizations
MPs	Microplastics
MPS	Minimum performance standard
MRZs	Uses Mineral Resource Zones
N/kN	Newtons per kilonewton
NAAQS	National Ambient Air Quality Standards
NCBI	National Center for Biotechnology Information
NESHAP	National Emission Standards for Hazardous Air Pollutants
NHTSA	National Highway Transportation Safety Administration
NIH	National Institutes of Health
NMFS	National Marine Fisheries Service
NO	Nitric oxide
NO_2	Nitrogen dioxide
NOAA	National Oceanic and Atmospheric Administration
NOP	Notice of Preparation
NOx	Oxides of nitrogen
NPDES	National Pollutant Discharge Elimination System
NR	Natural rubber
NRCS	Natural Resource Conservation Service
OE	Original equipment
OEHHA	Office of Environmental Health Hazard Assessment
OPR	Office of Planning and Research
PAHs	Polycyclic aromatic hydrocarbons
PBT	Persistent, bioaccumulative, and toxic
PFAS	Per- and polyfluoroalkyl substances
PM	Particulate matter
PM10	Particulate matter (less than 10 microns in diameter)
PM2.5	Fine particulate matter (less than 2.5 microns in diameter)
PMT	Persistent, mobile, and toxic
PRC	Public Resources Code
PTEs	Passenger tire equivalents
RMA	Rubber-modified asphalt
RMP	Regional Monitoring Program
ROG	Reactive organic gases
RRC	Rolling Resistance Coefficient

RRWA	Russian River Watershed Association
RTEP	Replacement Tire Efficiency Program
RTP	Regional Transportation Plan
RTPO	Regional Transportation Planning Organization
RWQCB	Regional Water Quality Control Board
SB	Senate Bill
SCCPs	Short-chain chlorinated paraffins
SCP	Safer Consumer Products
SCS	Sustainable community strategies
SIP	State Implementation Plan
SO_2	Sulfur dioxide
SOx	Sulfur oxides
SR	Synthetic rubber
SRA	State Responsibility Areas
SUV	Sport utility vehicle
SWRCB	State Water Resources Control Board
TACs	Toxic air contaminants
TCLP	Toxicity Characteristic Leaching Procedure
TDA	Tire-derived aggregates
TDF	Tire-derived fuel
TIC	Toxics Information Clearinghouse
TMAs	Transportation Management Areas
TMMM	Tetra(methoxymethyl)melamine
TNP	Tris(nonylphenyl) phosphate
TPs	Transformation products of tire rubber particles
TPZ	Timberland Production Zone
TRB	Transportation Research Board
TRWP	Tyre and road wear particles
TSCA	Toxic Substances Control Act
TWP	Tire wear particles
µg/L	Micrograms per liter
µm	Micrometer
URMS	Urban run-off mortality syndrome
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	United States Geological Survey
USTMA	U.S. Tire Manufacturers Association
UTQG	Uniform Tire Quality Grading

VMT	Vehicle miles traveled
VOC	Volatile organic compounds

Summary

Summary

This summary is provided in accordance with Section 15123 of the California Environmental Quality Act (CEQA)[1] Guidelines,[2] which states that an environmental impact report (EIR) "shall contain a brief summary of the proposed actions and its consequences. The language of the summary should be as clear and simple as reasonably practical." This summary includes the following:

1. A description of the project;
2. The environmental impacts of the project and recommended mitigation measures, if applicable;
3. Areas of controversy known to the California Energy Commission (CEC) including issues raised by agencies and the public; and
4. Issues to be resolved, including the choice among alternatives and whether or how to mitigate the significant effects.

S.1 Project Description Summary

Assembly Bill (AB) 844 (Nation, Chapter 645, Statutes of 2003) requires the CEC to develop and maintain a replacement tire efficiency program under Public Resources Code (PRC) sections 25770–25773. Pursuant to PRC sections 25770–25773, CEC staff designed the Replacement Tire Efficiency Program (RTEP) to ensure that replacement tires sold in California are at least as energy-efficient, on average, as original equipment (OE) tires on new passenger vehicles and light-duty trucks. PRC sections 25770–25773 direct the CEC to do the following:

- Develop a database of the energy efficiency of a representative sample of replacement tires sold in the state, based on test procedures adopted by the CEC.
- Develop a rating system for the energy efficiency of replacement tires sold in the state that will enable consumers to make more informed decisions when purchasing tires for their vehicles.
- Develop requirements for tire manufacturers to report to the CEC the energy efficiency of replacement tires sold in the state.
- Develop and adopt minimum energy efficiency standards for replacement tires that are technically feasible and cost effective, do not adversely affect tire safety,

[1] PRC § 21000 et seq. (The CEQA statutes generally require state and local government agencies to inform decision makers and the public about the potential environmental impacts of proposed projects and to reduce those environmental impacts to the extent feasible.)

[2] 14 CCR § 15000 et seq. (Guidelines) (Details the protocol by which state and local agencies comply with CEQA.) Hereinafter, the Guidelines are cited as the "State CEQA Guidelines."

do not adversely affect the average life of replacement tires, and do not adversely affect state efforts to manage scrap tires.

The proposed RTEP seeks to improve the energy efficiency of replacement tires through the establishment of minimum performance standards, as well as a consumer-focused efficiency rating system, for replacement tires for passenger cars and light-duty trucks sold in California, and to the extent possible ensure that they are at least as energy-efficient as the tires sold as original equipment tires on new vehicles. The proposed minimum standards would apply to the sale of new replacement tires starting with those manufactured on or after January 1, 2028, with a more stringent level coming into effect three years later in January 1, 2031 (referred to as Phase I and Phase II, respectively). Note that these implementation dates do not impact the review of potential adverse environmental impacts from the regulation but are noted here for completeness. The implementation dates do impact potential savings from the regulation, as the size of the forecasted vehicle fleet varies from year to year.

CEC staff differentiate the proposed rolling resistance minimum performance standards by tire-product class, reflecting the different performance attributes of different tires. Chapter 2, *Project Description*, provides a full description of the proposed RTEP.

Tires have a significant impact on the fuel economy of a vehicle because tire revolutions convert energy to heat, and that conversion affects the amount of fuel a vehicle will use. The rolling process that causes the heat conversion is measurable and is referred to as "rolling resistance." Rolling resistance affects the effort required to keep a given tire rolling. Effectively, the tire consumes a portion of the power transmitted to the wheels, leaving less energy available for moving the vehicle forward. The lower the rolling resistance, the less energy a vehicle uses to move the car forward. Therefore, a low-rolling-resistant tire is more energy efficient than a tire with higher rolling resistance.

This EIR evaluates the potential environmental impacts of the proposed RTEP, which will be implemented via rulemaking, and has been prepared in accordance with CEQA and the State CEQA Guidelines. The CEC is the CEQA lead agency responsible for the preparation of this EIR and will ultimately decide whether to approve the proposed RTEP. The CEC retained Aspen Environmental Group, an independent environmental consulting firm, to provide assistance in preparing this EIR.

S.2 Summary of Environmental Impacts

Table S-1, presented below, provides a summary of the environmental impacts associated with the implementation of the proposed RTEP that are evaluated in this EIR. The table presents the level of significance of each impact. Impacts can be categorized as the following:

- No Impact;
- Less Than Significant;

- Less Than Significant with Mitigation; or
- Significant and Unavoidable.

Table S-1 presents the significance conclusions for the proposed RTEP (presented in Chapter 3) and the alternatives analyzed in Chapter 5. The alternatives include the following:

- **Alternative 1: More Stringent Minimum Performance Standard.** This alternative includes the RRC minimum performance standard (MPS) proposed in 2023 in the *Draft Framework of California's Replacement Tire Efficiency Program*. Under this alternative, a more stringent MPS of 8.3 RRC would take effect on the Phase I implementation date and decrease to a 6.3 RRC on the Phase II implementation date.
- **Alternative 2: Less Stringent Minimum Performance Standard.** This alternative includes a less stringent MPS of 9.7 RRC to take effect on the Phase I implementation date and decrease to an 8.7 RRC on the Phase II implementation date.
- **No Project Alternative.** Under this alternative, the CEC would ignore the requirements of PRC sections 25770–25773 and would not develop nor maintain a Replacement Tire Efficiency Program.

As a reminder, the effective dates of the alternatives do not affect the environmental impact assessment because the potential adverse environmental impact of the alternatives does not vary with the implementation year.

The EIR does not identify any significant and unavoidable impacts for the RTEP. All impacts are identified as either "No Impact" or "Less Than Significant." CEC staff did not propose mitigation measures to reduce adverse effects because they did not identify any significant impacts.

Most categories of potential impact were eliminated from detailed analysis in the EIR because the RTEP does not have the potential to produce impacts related to those impact categories. Appendix A, *Initial Study*, uses the questions from Appendix G of the State CEQA Guidelines to provide the reasons the project would not result in environmental impacts for each of these impact categories.

CEQA focuses on a project's adverse effects on the environment and does not require an evaluation of a project's beneficial effects. However, because the RTEP, if approved, would provide several noteworthy benefits, the beneficial environmental effects of the program are summarized in Section 3.5, *Environmental Benefits*.

The impact conclusions for the resource/issue areas analyzed in detail in Chapter 3 are summarized below.

Utilities and Service Systems: Solid Waste

CEC staff do not expect the RTEP to have any significant direct or indirect effects related to solid waste facilities because the regulations would not result in foreseeable impacts to the waste tire stream in California. Since the RTEP is not expected to increase the amount of waste tire tonnage, no expansion of an existing waste tire facility or construction of a new facility would be needed. For these same reasons, the RTEP is not expected to contribute to cumulative effects related to waste tire streams or facilities. The RTEP also would not conflict with or violate any existing federal, state, or local statutes and regulations related to solid waste. The regulations would comply with the California Tire Recycling Act of 1990 and the stipulations of PRC sections 25770–25773 (see Section 3.1.2, *Regulatory Setting*). Therefore, CEC staff concluded that solid waste impacts would be less than significant.

Hazardous Materials

Since the proposed standards are based on performance criteria rather than prescriptive requirements, manufacturers are free to pick from a range of strategies to improve tire efficiency. While it is not known exactly which strategies manufacturers will choose to reduce the rolling resistance of replacement tires, CEC staff do not expect the RTEP to cause modifications of tire rubber in ways that would significantly increase the amounts of hazardous substances in tires. In particular, CEC staff have concluded that it is not reasonable to expect the RTEP to cause an increase in the use of additives that do not improve the rolling resistance of tire rubber. This includes the use of antiozonants (e.g., 6PPD[3]) and antioxidants as they do not improve the rolling resistance of tires. The RTEP standards are designed with the intent of avoiding any significant increase in tread wear that would reduce the average life of replacement tires. If the intent of the standards is realized in this regard, the RTEP would not result in an increase in the shedding of tread wear particles (TWPs) that can release harmful chemicals into the environment. For these reasons, CEC staff have concluded that the implementation of the RTEP would not substantially increase any hazards to the public or the environment associated with the routine transport, use, or disposal of replacement tires. Therefore, impacts would be less than significant.

Air Quality

CEC staff do not expect the RTEP to cause an increase in vehicle exhaust or tire-wear-related emissions. CEC staff designed the RTEP standards with the intent of improving fuel efficiency and avoiding any significant increase in tread wear. For these reasons, CEC staff have concluded that the implementation of the RTEP is not likely to result in a substantial increase in motor vehicle exhaust or tire-wear-related emissions. Therefore, air quality impacts would be less than significant.

[3] N-(1,3-dimethylbutyl)-N′-phenyl-p-phenylenediamine

Table S-1: Summary of Environmental Impacts

Impacts	Proposed RTEP	Alt. 1 (More Stringent MPS)	Alt. 2 (Less Stringent MPS)	No Project Alt.*
Solid Waste				
Generation of solid waste exceeding state or local standards or the capacity of local infrastructure, or impairment of the attainment of solid waste reduction goals	Less Than Significant	Less Than Significant	Less Than Significant	No Impact
Compliance with federal, state, and local management and reduction statutes and regulations related to solid waste	Less Than Significant	Less Than Significant	Less Than Significant	No Impact
Hazardous Materials				
Hazards to the public or the environment through the routine transport, use, or disposal of hazardous materials	Less Than Significant	Less Than Significant	Less Than Significant	No Impact
Air Quality				
Conflicts with applicable air quality plans	Less Than Significant	Less Than Significant	Less Than Significant	No Impact
Cumulatively considerable net increases of criteria pollutants	Less Than Significant	Less Than Significant	Less Than Significant	No Impact
Biological Resources				
Adverse effects, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species	Less Than Significant	Less Than Significant	Less Than Significant	No Impact
Adverse effects on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations	Less Than Significant	Less Than Significant	Less Than Significant	No Impact
Adverse effects on state or federally protected wetlands	Less Than Significant	Less Than Significant	Less Than Significant	No Impact

Notes: MPS = Minimum Performance Standard
* The environmental benefits described in Section 3.5 would not be realized.

Biological Resources

CEC staff have concluded that the implementation of the RTEP would not result in any significant impacts on biological resources that can be identified at this time. It is possible that tire manufacturers will develop modified rubber compounds that help reduce the rolling resistance of replacement tires; however, the exact nature of such changes cannot be predicted with reasonable specificity and will likely vary among manufacturers. CEC staff designed the RTEP to avoid any significant increase in tread wear that would reduce the average life of replacement tires. If the intent of the standards is realized in this regard, CEC staff do not expect the RTEP to result in increases of shedding of TWPs that can release harmful chemicals into the environment and potentially have an adverse effect on wildlife or habitat. Therefore, impacts on biological resources are expected to be less than significant.

S.3 Summary of Known Areas of Controversy

In accordance with Public Resources Code section 21092 and State CEQA Guidelines Section 15082, the CEC issued a Notice of Preparation in September 2024, seeking input from responsible and trustee agencies and the general public regarding the scope and content of environmental topics to address in the EIR. CEC staff also hosted a virtual scoping meeting on September 30, 2024, to hear concerns about the environmental effects of the RTEP. The CEC accepted comments on the scope of the EIR between September 17 and October 18, 2024. In total, the CEC received two comment letters. CEC staff did not identify any clear areas of controversy in these comments, but noted the following concerns:

- Effects of the proposed RTEP on tire wear and relative wet grip braking performance (traction) (addressed in Sections 2.5.2, *Safety Considerations,* and 2.5.3, *Tire Life and Durability*),
- Potential for stockpiles of unsold replacement tires that do not meet the proposed efficiency standards (addressed in Section 3.1, *Utilities and Service Systems: Solid Waste*),
- Need for consistent testing standards (addressed in Section 2.4.4, *Testing Procedures*), and
- Need for evaluation and possible adjustment of the proposed regulations after implementation (addressed in Section 2.4.1, *Regulatory Framework*).

The EIR and its appendices address areas of controversy that fall within the scope of CEQA. Issues that fall outside the scope of CEQA are not evaluated in this EIR.

S.4 Summary of Issues to be Resolved

The main issue facing the CEC regarding the proposed RTEP is whether to adopt the program as recommended by staff. The primary issues are whether the recommended

minimum performance standards for rolling resistance and relative wet grip braking performance are appropriate and whether the proposed dates for compliance with Phase I and Phase II of the program are feasible. As discussed for the alternatives, staff considered more stringent and less stringent minimum performance standards for rolling resistance. Staff decided to recommend standards that include adjustments for certain categories of tires (low-load index tires, light-duty truck tires, long-life tires, and ultra long-life and ultra high-performance tires). CEC staff proposed these adjustments to ensure that the unique performance characteristics of these types of tires are maintained, while also improving their efficiency. The proposed dates for compliance with the RTEP standards are later than the dates proposed in the Draft Framework for the RTEP published in February 2023. The current proposal for the RTEP provides more time for tire manufacturers to comply with the proposed minimum performance standards in order to improve the feasibility of compliance.

Chapter 1

Introduction

1 Introduction

This Draft EIR evaluates the potential environmental impacts of the proposed regulations adopting the Replacement Tire Efficiency Program (RTEP) in accordance with the requirements of the California Environmental Quality Act (CEQA, Public Resources Code sections 21000–21177) and the State CEQA Guidelines (California Code of Regulations sections 15000–15387). The California Energy Commission (CEC) is the CEQA lead agency responsible for the preparation of this EIR and will ultimately decide whether to approve the proposed RTEP. CEC staff retained Aspen Environmental Group, an independent environmental consulting firm, to provide assistance in preparing this EIR; CEC staff has reviewed and approved this analysis.

1.1 Purpose and Intended Use of this EIR

CEQA requires that public agencies in California consider the significant adverse environmental effects of projects over which they have discretionary approval authority before making a decision to approve those projects. The preparation of an EIR is required whenever a project (in this case, the proposed RTEP) may result in a significant adverse impact on the physical environment. An EIR is an informational document used to (1) inform agency decision makers and the general public of any potential significant environmental effects of a project, (2) identify possible ways to mitigate or avoid any potential significant effects, and (3) describe a range of reasonable alternatives to the project that could feasibly attain most of the basic objectives of the project while substantially lessening or avoiding any of the significant environmental impacts of the project. Public agencies are required to consider the information presented in the EIR when determining whether to approve a project.

The CEC is the lead agency, as defined by CEQA. No other public agencies have jurisdiction over the project.

1.2 Scope of the EIR

This EIR evaluates the proposed Replacement Tire Efficiency Program (referred to as RTEP or project). The proposed RTEP seeks to improve the energy efficiency of replacement tires through the establishment of minimum performance standards, a consumer-focused efficiency rating system for replacement tires of passenger cars and light-duty trucks sold in California, and to the extent possible, ensure that replacement tires are at least as energy-efficient as the tires sold as original equipment tires on new vehicles. The proposed minimum performance standards would apply to the sale of new replacement tires starting with those sold on or after January 1, 2028 (Phase I), with a more stringent level coming into effect three years later in January 1, 2031 (Phase II). Chapter 2, *Project Description,* provides a full description of the proposed RTEP.

Under the requirements of CEQA, the degree of specificity required in an EIR corresponds to the degree of specificity involved in the underlying activity that is

described in the EIR.[4] CEQA provides that an EIR for a project such as the adoption or amendment of a plan or regulations should focus on the secondary effects that can be expected to follow from the adoption or amendment, but that the EIR need not be as detailed as an EIR for a more specific type of project, such as a construction project. The analysis in this EIR addresses proposed regulations to set standards for the efficiency of replacement tires for passenger vehicles and light-duty trucks; however, the establishment of the proposed regulations does not involve the actual manufacturing or distribution of tires, which may have their own environmental effects. A general level of detail is appropriate. CEC staff made a rigorous effort to evaluate potential significant adverse impacts of the proposed regulation and present as much information about those impacts as is currently available, without being unduly speculative. This EIR also describes the implementation of the RTEP.

The scope of analysis in this EIR intends to help focus public review and comments on the proposed RTEP and ultimately to inform the CEC of the environmental benefits and adverse impacts before any CEC action to approve the RTEP. This analysis focuses on reasonably foreseeable and potentially significant adverse impacts on the physical environment resulting from "compliance" with the project. The term "compliance" refers to the reasonably foreseeable activities that may occur in response to the provisions in the RTEP, including establishment of a minimum efficiency performance standard for replacement tires, and a tire efficiency rating system.

CEC staff determined the types of impacts that may have the potential to be significant based on research and analysis of the relevant aspects of the proposed RTEP, as well as on the comments received as part of the public scoping process (Appendix C, *Scoping Comments*). CEC staff determined that the project does not have the potential to cause significant adverse impacts on the environment related to the following topics:

- Aesthetics
- Agriculture and Forestry Resources
- Cultural Resources
- Energy
- Geology and Soils
- Greenhouse Gas Emissions
- Hydrology and Water Quality
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation
- Tribal Cultural Resources
- Wildfire

Because CEC staff concluded that the RTEP does not have the potential to cause significant adverse impacts related to the topics listed above, they are not evaluated in detail for this EIR. Appendix A, *Initial Study*, provides the reasoning for the determination that significant adverse impacts would not occur related to these topics.

[4] State CEQA Guidelines, § 15146.

Based on research and analysis of the project during the preparation of this EIR and the comments received as part of the public scoping process (Appendix C, *Scoping Comments*), CEC staff determined that the RTEP does have some potential to result in significant adverse environmental effects related to Utilities and Service Systems (specifically solid waste), Hazardous Materials, Air Quality, and Biological Resources. As a result, these environmental topics are the focus of this EIR.

1.3 Agency Roles and Responsibilities

Assembly Bill (AB) 844 (Nation, statutes of 2003) directed the CEC to develop and maintain a replacement tire efficiency program under Public Resources Code Sections 25770–25773. As the lead agency under CEQA, the CEC is responsible for considering the information about environmental impacts contained in this EIR and determining whether to approve the RTEP as proposed.

Under CEQA, a responsible agency is a public agency that proposes to carry out or approve the project, for which the lead agency is preparing or has prepared an EIR.[5] CEC staff did not identify any responsible agencies for the proposed project.

A trustee agency is a state agency that has jurisdiction by law over natural resources that are held in trust for the project of the State of California.[6] The California Department of Fish and Wildlife is California's trustee agency for the state's fish, wildlife, and plant resources, and it may consider and comment on this EIR in fulfillment of its duties. California's three other trustee agencies (State Lands Commission, State Department of Parks and Recreation, and University of California) may also decide to comment on this EIR.

No other agency is expected to use the EIR, and no other permits or approvals are necessary for the RTEP.

1.4 CEQA Public Review Process

1.4.1 Notice of Preparation

The purpose of a Notice of Preparation (NOP) is to provide sufficient information about a project and its potential environmental impacts to allow agencies and interested parties the opportunity to provide meaningful input related to the scope and content of the EIR. This includes measures to reduce significant impacts that should be considered and alternatives that should be addressed to reduce significant impacts. Comments submitted in response to the NOP are used by the lead agency to help identify topics to be addressed in the EIR.

In accordance with State CEQA Guidelines Section 15082, the CEC issued an NOP in September 2024 to inform public agencies and the general public of the preparation of

[5] State CEQA Guidelines, § 15381.

[6] State CEQA Guidelines, § 15386.

the Draft EIR for the proposed RTEP. The NOP invited agencies and the public to provide comments on the scope and content of the report (Appendix C, *Scoping Comments*). The CEC submitted the NOP to the State Clearinghouse to distribute the NOP to potential responsible and trustee agencies (State Clearinghouse # 2024090611). The CEC circulated the NOP for a 30-day review period starting on September 17, 2024, and accepted comments submitted through October 18, 2024.

In accordance with State CEQA Guidelines Section 15082(c), the CEC issued the notice for a virtual scoping meeting for the Draft EIR on September 17, 2024. CEC staff hosted this virtual scoping meeting on September 30, 2024. During this meeting, CEC staff provided an overview of the proposed RTEP and EIR process and provided members of the public and other agencies with an opportunity to give input on any potentially significant environmental effects of the RTEP. CEC staff reviewed and considered all oral comments heard during the virtual meeting and written comments received during the NOP comment period. CEC staff addressed the comments, as appropriate, in the applicable technical sections of this EIR.

The comments received during the scoping period are summarized in Table 1-1, below. The full text of the comments is provided in Appendix C, *Scoping Comments*.

Table 1-1. Summary of Scoping Comments

Commenter	Comment Summary	How Addressed
Kendrick Mensink	- Tradeoffs of safety via reduced tire grip and of waste via wear particulate and bulk used tire life should be studied and quantified. - The RTEP should raise the efficiency threshold without compromising safety, and minimize waste. - Consult with existing tire testing services to determine the environmental costs to tire manufacturers to implement their own testing. There should be a requirement to help ensure fairness and similar testing conditions. - Wear-rates for low rolling resistance tires should have metrics. - Potential for an inventory of unsold replacement tires that do not meet the minimum efficiency requirements. Could a "black market" develop for subpar replacement tires that should be explicitly prevented?	These comments are primarily suggestions for study or for provisions to consider for inclusion in the RTEP. Compliance costs and economic considerations are not appropriate for inclusion in the CEQA analysis. Please see EIR Chapter 2 for the relevant provisions of the proposed RTEP.

Commenter	Comment Summary	How Addressed
	- Requests comparison of a state-managed tire testing facility vs. free market facilities.	
Tom Jordan, Director of Policy and Government Affairs, San Joaquin Valley Air Pollution Control District	- If there are future development projects, project construction and operational air emissions should be identified, characterized, and reduced to levels below the District's significance thresholds. Mitigate impacts to the extent feasible. - Environmental reviews of potential impacts on air quality should incorporate construction emissions and operational emissions. Emissions should be modeled. - A project subject to District rules and regulations would reduce its impacts on air quality through compliance with District regulations. - Future development projects may be subject to District Rules 2010 and 2201.	These comments pertain to requirements for air quality analysis and mitigation for any future development projects that may occur within the jurisdiction of the San Joaquin Valley Air Pollution Control District. The comments are not directly applicable to the RTEP.
Jay Spears, Continental Tire *(Verbal comment from the scoping meeting.)*	- One of the assumptions is that there would be no change to tire wear performance. That may not be known until the RTEP is implemented.	This concern relates primarily to the RTEP rather than the EIR. The RTEP is designed not to increase tire wear. If the regulations are not working as intended, they can be amended in the future. See Section 2.4.1.
Kelly Grant, Department of Toxic Substances Control *(Verbal comment from the scoping meeting.)*	- Was there any initial scoping of issues that reviewers can respond to? - Is there any process for ongoing monitoring once the regulations go into effect?	The NOP listed potential issues of concern, including solid waste and water quality, which are addressed in EIR Sections 3.1, 3.2, and 3.4. The regulations will be reviewed every three years and amended if needed.
Thomas Becherer, Continental Tire Germany *(Verbal comment from the scoping meeting.)*	- Will the CEC take experiences from other parts of the world into consideration, like limits on tire labels in Europe?	This concern relates primarily to the RTEP rather than the EIR. Please see Section 2.4 in EIR Chapter 2 for a description of the RTEP, including a proposed tire efficiency rating system and

Commenter	Comment Summary	How Addressed
		a publicly available database to provide a means to compare the variety of rolling resistance characteristics found in the replacement tire market.

In accordance with the requirements of Public Resources Code section 21080.3.1(b)(1), the CEC sent out a notice to tribes in California regarding the RTEP. No tribes requested consultation in response to the notice.

1.4.2 Draft EIR

The CEC is circulating this Draft EIR for a 45-day period of review and comment by the general public, interested parties, agencies, and organizations. In accordance with State CEQA Guidelines Section 15087(a), the CEC has provided public notice of availability of this Draft EIR to all persons and organizations that had previously requested such notice in writing by emailing the Notice to all persons subscribed to the following CEC service list: Replacement Tire Efficiency Program.

State CEQA Guidelines Section 15087(a) also requires that the Notice be given by at least one of the following procedures:

1. Publication at least one time in a newspaper of general circulation in the area affected by the proposed project. If more than one area is affected, the notice shall be provided in the newspaper of largest circulation from among the news-papers of general circulation in those areas.

2. Posting of notice by the public agency on and off site in the area where the project is to be located.

3. Direct mailing to the owners and occupants of property contiguous to the parcel or parcels on which the project is located. Owners of such property shall be identified as shown on the latest equalized assessment roll.

To comply with Section 15087(a), the CEC published the Notice in the Los Angeles Times. In accordance with State CEQA Guidelines Section 15087(e)-(f), the CEC submitted the Draft EIR to the State Clearinghouse to distribute to state agencies for review.

In addition, as encouraged by State CEQA Guidelines Section 15087(d), the CEC posted the Draft EIR to the RTEP website at:

https://www.energy.ca.gov/proceeding/replacement-tire-efficiency-program-proceeding

Hardcopies of the Draft EIR are available at the following location for review:

California Energy Commission
715 P Street
Sacramento, California 95814-5512

During the 45-day public comment period, written comments on the Draft EIR's accuracy and completeness may be submitted to the CEC. Written comments (including via email) must be received by 5:00 p.m. on June 9, 2026.

The CEC encourages use of its electronic commenting system. To submit written comments electronically, visit the e-commenting page at:

https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=24-TIRE-01

Please note that written comments, attachments, and associated contact information (including address, phone number, and email address) will become part of the public record with access available via any internet search engine.

Written comments may be submitted by email. Include docket number 24-TIRE-01 and "Tire Efficiency Environmental Impact Report" in the subject line and email to docket@energy.ca.gov.

A paper copy of written comments may be sent to:

California Energy Commission
Docket Unit, MS-4
Docket No. 24-TIRE-01
715 P Street
Sacramento, California 95814

1.4.3 Final EIR

After the end of the 45-day public comment period, CEC staff will prepare written responses to comments received on the Draft EIR. Consistent with State CEQA Guidelines Section 15088(b), the responses to comments made by public agencies will be provided to the commenting agencies at least 10 days before any action is taken to approve the proposed project. The CEC Commissioners will then consider the Final EIR (containing the revised Draft EIR and the Responses to Comments document) for adoption at a CEC business meeting.

The level of detail contained throughout this EIR is consistent with State CEQA Guidelines Section 15151 and court decisions, which provide the standards of adequacy on which this EIR is based. The Guidelines state as follows:

> An EIR should be prepared with a sufficient degree of analysis to provide decision makers with information which enables them to make a decision which intelligently takes account of the environmental consequences. An evaluation of the environmental effects of a proposed project need not be

> exhaustive, but the sufficiency of an EIR is to be reviewed in the light of what is reasonably feasible. Disagreement among experts does not make an EIR inadequate, but the EIR should summarize the main points of disagreement among the experts. The courts have looked not for perfection but for adequacy, completeness, and a good faith effort at full disclosure.[7]

As such, the standards for adequacy provide that an EIR can be certified if (1) the EIR provides sufficient analysis to allow decisions to be made regarding the proposed project with consideration given to its environmental impacts, and (2) the EIR shows a good faith effort at full disclosure of environmental information. If the CEC Commissioners find that the Final EIR is adequate, complete, and a good faith effort at full disclosure, the CEC Commissioners may certify the Final EIR in accordance with CEQA.

1.5 Organization of this EIR

This EIR is organized into an Executive Summary and six chapters, as described below:

- **Summary.** This chapter provides a concise overview of the proposed project; a brief overview of the adverse environmental impacts identified and mitigation measures to reduce or eliminate significant impacts; areas of known controversy and issues to be resolved; and project alternatives.
- **Chapter 1, Introduction.** This chapter describes the purpose, intent, and scope of the EIR; identifies the roles and responsibilities of the lead agency and responsible and trustee agencies; explains the environmental review process, including the preparation of the NOP, Draft EIR, and Final EIR; and explains the organization of the EIR.
- **Chapter 2, Project Description.** This chapter provides a description of the project; presents the location of the project; identifies the objectives sought by the project; discusses the project's technical, economic, and environmental characteristics; and identifies the intended uses of the EIR by the lead agency and responsible and trustee agencies.
- **Chapter 3, Environmental Setting, Impacts, and Mitigation.** This chapter describes the environmental setting; discusses the regulatory setting; and analyzes the potential environmental impacts of the project and identifies if mitigation measures are necessary to reduce significant impacts to less-than-significant levels, if feasible. The analysis is organized in the following environmental resource topics derived from State CEQA Guidelines Appendix G:
  - 3.1. Utilities and Service Systems (Solid Waste)
  - 3.2. Hazardous Materials
  - 3.3. Air Quality
  - 3.4. Biological Resources

[7] State CEQA Guidelines, § 15151.

CEC staff concluded that there is no potential for the project to cause significant environmental impacts related to most environmental topics. The reasoning that supports that conclusion is provided in Appendix A, *Initial Study*.

- **Chapter 4, Other CEQA Discussions.** This chapter includes other discussions required by either CEQA or CEC policy, including analysis of environmental justice issues, Mandatory Findings of Significance, and analysis of the project's potential contribution to cumulative impacts and growth-inducing impacts.
- **Chapter 5, Alternatives.** This chapter includes a discussion of a reasonable range of alternatives to the proposed project which could feasibly avoid or lessen the project's significant impacts and evaluates the comparative merits of the alternatives by assessing the extent to which the alternatives could meet the basic project objectives.
- **Chapter 6, List of Preparers.** This chapter provides the list of preparers of this EIR, including CEC's technical staff, other CEC staff, and consultants.
- **Chapter 7, References.** This chapter lists the references cited in this EIR.
- **Appendices.** This EIR includes the following appendices:
  A. Initial Study
  B. Notice of Preparation
  C. Scoping Comments
  D. Rolling Resistance and Tire Technology
  E. Waste Tire Disposal in California

Chapter 2

Project Description

2 Project Description

This chapter provides a description of the Replacement Tire Efficiency Program (RTEP or project) proposed by California Energy Commission (CEC) staff. For the purposes of this EIR, the CEC considers adoption and implementation of the RTEP to be the "project" evaluated under CEQA. CEQA defines a "project" as a discretionary action that has the potential to result in either a direct physical change in the environment, or a reasonably foreseeable indirect physical change in the environment.[8] Here, implementation of the proposed RTEP has the potential to result in either a direct physical change in the environment or a reasonably foreseeable indirect physical change in the environment.

The proposed RTEP seeks to improve the energy efficiency of replacement tires through minimum performance standards and improving consumer access to relevant tire efficiency information, and to ensure to the extent feasible that replacement tires for passenger cars and light-duty trucks sold in California are at least as energy-efficient as the original equipment (OE) tires sold on new vehicles. Implementation of the program requires the adoption of a regulation, which the CEC will develop through a rulemaking proceeding.

This chapter describes the project's location, objectives, and technical, economic, and environmental characteristics, as well as the intended use of this EIR. The information in this chapter is derived primarily from a CEC staff report *California's Proposed Replacement Tire Efficiency Program* (Blackburn et al. 2026).

2.1 Project Location

The project is the establishment of energy efficiency standards for replacement tires sold in California and would be applicable statewide. The project would also establish public information requirements regarding the efficiency of replacement tires that would be applicable statewide. Therefore, for purposes of this EIR, the boundary of the project area is the boundary of the state of California as set forth in the California Constitution and state statutes.

2.2 Statement of Project Objectives

Assembly Bill (AB) 844 (Nation, Chapter 645, Statutes of 2003), codified at Public Resources Code (PRC) sections 25770–25773, requires the CEC to develop and maintain a replacement tire efficiency program. The primary objective of the RTEP is:

- To implement a tire efficiency program of statewide applicability for replacement tires, designed to ensure that replacement tires sold in the state of California are

[8] State CEQA Guidelines, 14 CCR, § 15378.

at least as energy-efficient, on average, as tires sold in the state as original equipment on new passenger vehicles and light duty trucks.

In furtherance of this objective, PRC sections 25770–25773 directs the CEC to:

- Develop a database of the energy efficiency of a representative sample of replacement tires sold in the state, based on test procedures adopted by the CEC.
- Develop a rating system for the energy efficiency of replacement tires sold in the state that will enable consumers to make more informed decisions when purchasing tires for their vehicles.
- Develop requirements for tire manufacturers to report to the CEC the energy efficiency of replacement tires sold in the state.
- Develop and adopt minimum energy efficiency standards for replacement tires. These standards shall:
    - Be technically feasible and cost effective.
    - Not adversely affect tire safety.
    - Not adversely affect the average life of replacement tires.
    - Not adversely affect state efforts to manage scrap tires.

The energy efficiency standards established in PRC section 25773(a)(1) shall be based on the results of laboratory testing and an on-road fleet testing program developed and conducted by tire manufacturers in consultation with the CEC and the California Integrated Waste Management Board (now CalRecycle). If tires used to equip an authorized emergency vehicle, as defined in section 165 of the California Vehicle Code, are unable to meet the standards established pursuant to PRC section 25773(a)(1), the CEC shall authorize an operator of an authorized emergency vehicle fleet to purchase for those vehicles tires that do not meet those standards. Furthermore, the CEC, in consultation with CalRecycle, shall review and revise the program, including any standards adopted pursuant to the program, as necessary, but not less than once every three years. The commission may not revise the program or standards in a way that reduces the average efficiency of replacement tires.

Tires have a significant impact on the fuel economy of a vehicle because tire revolutions convert energy to heat, and that conversion affects the amount of fuel a vehicle will use. The rolling process that causes the heat conversion can be measured and is referred to as "rolling resistance." Rolling resistance affects the effort required to keep a given tire rolling. Effectively, the tire consumes a portion of the power transmitted to the wheels, leaving less energy available for moving the vehicle forward.

The lower the rolling resistance, the less energy a vehicle uses to move the car forward. Therefore, a low-rolling-resistant tire is more energy efficient than a tire with higher rolling resistance. By reducing rolling resistance, vehicles become more fuel efficient, allowing California drivers to save money on fuel. The CEC estimates the RTEP would

result in fuel savings of $179 for lighter vehicle tires and $246 for heavier vehicle tires over the lifespan of a set of four high efficiency (low rolling resistance) tires (Blackburn et al. 2026, Chapter 8).

Further, better fuel efficiency means that less gasoline for combustion vehicles and less electricity for electric vehicles (or other fuels, such as diesel, hydrogen, etc.) would be needed to power California's passenger vehicles. This would improve public health and air quality because less fuel would be combusted, and fewer air pollutants would be put into the atmosphere as a result of lower tailpipe emissions (for combustion engines) and lower emissions upstream as a result of fuel production. It would also be beneficial for combatting the climate crisis because fewer greenhouse gases and criteria pollutants would be emitted. The CEC estimates the potential annual reduction in emissions to be 2.0 million metric tons (MMT) of carbon dioxide equivalent (CO_2e) in 2035, assuming a 90 percent compliance rate with the proposed project (Blackburn et al. 2026, Chapter 9).

2.3 Legislative and Policy Background

2.3.1 Federal

There are several federal laws that historically pertain to minimum fuel economy standards, tire efficiency, and consumer information for passenger automobiles. The Motor Vehicle Information and Cost Savings Act of 1972 mandated a federal program to provide consumers with information on damage susceptibility, crashworthiness, ease of diagnosis and repair, and operating costs for passenger motor vehicles.[9] In 1975, Congress passed the Energy Policy and Conservation Act (EPCA), which included the creation of Corporate Average Fuel Economy (CAFE) standards. The law requires automobile manufacturers to meet average fuel economy standards (set by the U.S. Environmental Protection Agency [EPA] Administrator, and increasing in stringency over time) for each vehicle model in a model year.[10] Since CAFE standards only apply to new vehicles manufactured in the model year, and low-rolling resistance tires are an attractive, low-cost option to boost vehicle fuel economy, original equipment tires have tended to be more fuel-efficient than replacement tires (to which CAFE standards do not apply).

It is noteworthy that in July 2025, the passage of House of Representatives Bill 1 (referred to as One Big Beautiful Bill Act) updated the CAFE standards by removing penalties for non-compliance. As a result, automakers are less likely to develop and sell increasingly fuel-efficient vehicles. This may also lessen automobile manufacturers' demand for fuel efficient tires.

[9] Pub. L. No. 92–513, §1, Oct. 20, 1972, 86 Stat. 947.

[10] Pub. L. No. 94-163, title V, §§ 501-506, Dec. 22, 1975, 89 Stat. 901-911.

The EPCA also requires automobile manufacturers and dealers to attach and maintain labels to each automobile manufactured in a model year indicating the fuel economy, estimated annual operating fuel cost, and the range of fuel economy of comparable automobiles. Title 49, section 32908 of the United States Code adds conditions for the label to include the amount of fuel efficiency tax imposed on the sale of the automobile, and for dealers to make a booklet available to the consumer for comparing the fuel economy of other automobiles (across all manufacturers) in the same model year.[11]

The Energy Independence and Security Act of 2007 (EISA) directs the Secretary of Transportation to promulgate rules establishing a national tire fuel efficiency consumer information program for motor vehicle replacement tires.[12] The law amends Chapter 323 of title 49 of the United States Code, section 32304A, "Consumer tire information," to include a national tire efficiency rating system for motor vehicle replacement tires, requirements for providing and disseminating information to consumers, specifications for test methods for manufacturers to use in assessing and rating tires, and a national tire maintenance consumer education program.[13]

In 2010, and amended in 2012, the National Highway Transportation Safety Administration (NHTSA) promulgated regulations to partially implement a federal Tire Fuel Efficiency Consumer Information Program under the EISA.[14] NHTSA prescribes the test methods that manufacturers use to determine the rolling resistance rating, peak wet traction rating, and treadwear rating of each replacement tire. The EISA provides a preemption savings clause related to state regulation of the fuel efficiency of tires including establishing testing methods for determining compliance as well as state regulation on tire fuel efficiency consumer information. Additionally, at the time of drafting this EIR, NHTSA had not adopted the rating systems, an implementation date for manufacturers to begin reporting ratings, the conditions for point-of-sale and information dissemination, nor the national tire maintenance consumer education program components of the EISA (Blackburn et al. 2026, Chapter 3).

2.3.2 State

The Warren-Alquist Act of 1975 established the State Energy Resources Conservation and Development Commission (known as the California Energy Commission) and directs the agency to develop state transportation energy policies that result in the least environmental and economic cost to the state. Among several objectives, it is the policy of the state to implement practicable and cost-effective measures that include the purchase of the cleanest and most efficient automobiles and replacement tires, the use of alternative fuels in its fleets, and other conservation measures.[15]

[11] 49 U.S.C. § 32908(b)(D, E).

[12] Pub. L. No. 110-140, title I, § 111, Dec. 19, 2007.

[13] 49 U.S.C. § 32304A.

[14] See 49 CFR § 575.106(d)(2).

[15] PRC § 25000.5(a-c).

Several regulations have identified tire efficiency as a strategy to reduce petroleum dependence, transportation-related GHG emissions, and environmental and public health costs. AB 2076 (Shelley, Chapter 936, Statutes of 2000) directed the CEC and California Air Resources Board (CARB) to develop and adopt recommendations to reduce gasoline and diesel fuel consumption, increase transportation energy efficiency, and utilize alternative fuels and alternative-fueled vehicles. The two agencies produced a joint report that identified fuel-efficient tires as one potential strategy to meet these goals (CEC and CARB 2003).

Senate Bill (SB) 1170 (Sher, Chapter 912, Statutes of 2001) required the CEC, State Department of General Services, and CARB to develop and adopt fuel-efficiency specifications governing the purchase of motor vehicles and replacement tires that would reduce the energy consumption of the state vehicle fleet by 10 percent. The bill also required the CEC to develop and adopt recommendations for consideration by the Governor and Legislature for a California State Fuel-Efficient Tire Program. In accordance with these bill requirements, the CEC produced a two-volume report studying the potential for a state fuel-efficient tire program (CEC 2003a, CEC 2003b). The two reports conclude that the potential savings from fuel-efficient tires is substantial, sufficient data is not available to draw conclusions regarding the performance and characteristics of fuel-efficient tires, a preferred test procedure for measuring tire rolling resistance is available, and lack of consumer information hinders widespread use of fuel-efficient tires (CEC 2003a). The reports recommend that the state proceed with a replacement tire efficiency program that includes data collection and the development of an efficient tire information program (Blackburn et al. 2026, Chapter 3).

The California Legislature passed AB 844 (Nation, Chapter 645, Statutes of 2003), codified at PRC sections 25770–25773, in 2003. This bill amended the Warren-Alquist Act to direct the CEC to develop an efficiency program of statewide applicability for replacement tires for passenger cars and light trucks no later than July 1, 2006. The CEC initiated rulemaking proceedings in 2003 and again in 2007, but the deadlines established in the legislation were not met for various reasons (for one, the CEC paused the program's development to defer to the federal effort by NHTSA). The CEC relaunched the Replacement Tire Efficiency Program in November 2020 with the issuance of the order instituting informational proceeding, Order 20-1110-3 (Blackburn et al. 2026, Chapter 1).

To address the growing challenges of waste tires, AB 1843 (Brown, Chapter 974, Statutes of 1989), known as the California Tire Recycling Act of 1990 (Recycling Act), was passed to reduce the amount of used tires in landfills and to address the problems associated with the storage and disposal of used tires. The Recycling Act established a comprehensive, statewide response, including reducing landfill disposal of used whole tires, recycling of tires into secondary uses, source material development and promotion of secondary markets for used tire by-products, tire shredding, and energy recovery.

2.4 Project Characteristics

While federal CAFE standards have incentivized energy efficient OE tires on new cars, these standards do not apply to replacement tires, which has resulted in replacement tires not being as energy efficient as OE tires. Replacement tires tend to vary greatly in efficiency and, on average, original equipment tires are roughly 20 percent more efficient than replacement tires (Blackburn et al. 2026, Chapter 2).

Key Regulation Components

The RTEP proposes minimum performance standards (MPS) and public information requirements for replacement tires through the use of a database. There are several key components to the RTEP regulation, with the effective dates for each component shown in Table 2-1.

Table 2-1: Key Regulation Components

Regulation Component	Effective Date
Reporting requirements for tire manufacturers for inclusion in a CEC database	January 1, 2028
Rolling Resistance Coefficient (RRC) Minimum Performance Standard	Phase I – January 1, 2028 Phase II – January 1, 2031
Relative Wet Grip Braking Performance Index Performance Standard	January 1, 2028

Source: Blackburn et al. 2026, ES.

Tire Efficiency Minimum Performance Standard

PRC section 25773(a) requires the CEC to adopt minimum energy efficiency standards for replacement tires. Rolling resistance is a standard measurement for characterizing and comparing tire energy performance. The proposed RTEP will implement rolling resistance minimum performance standards in two phases to give manufacturers time to prepare and adjust to the standards. A minimum efficiency performance range of 9.0 to 9.8 rolling resistance coefficient (RRC) in newtons per kilonewtons (N/kN)[16] would apply to the sale of new replacement tires starting on January 1, 2028 (Phase I), with a more stringent range of 7.1 to 8.5 RRC taking effect on January 1, 2031 (Phase II). Table 2-2 shows the different RRC levels that will be required for different replacement tire types during Phase I and Phase II of RTEP implementation.

[16] A newton (N) is the international unit of measure for force. One newton is equal to 1 kilogram meter per second squared. A kilonewton (kN) is equivalent to one thousand newtons.

Table 2-2: RRC Minimum Performance Standard by Replacement Tire Type

Tire Category	Phase I: 1/1/2028	Phase II: 1/1/2031
Base tires	9.0	7.1
Low-load index tires	9.5	7.6
Light-duty truck tires	9.0	7.8
Long-life tires	9.4	7.8
Ultra-long-life and ultra-high-performance tires	9.8	8.5

Source: CEC staff.

It is important to note that these effective dates do not affect the analysis of the environmental impact of the regulation. However, they do affect the potential fuel savings from the regulation.

Tire Efficiency Rating System

Along with MPS, the RTEP proposes a tire rating system for fuel efficiency. Providing a fuel efficiency rating along with available Uniform Tire Quality Grading (UTQG) system data is intended to help consumers easily determine how various tire models are expected to affect the fuel economy of their vehicle. The proposed efficiency rating system for tire models is based on a zero-to-four leaf scale (four leaves being the most efficient). The ranges shown for each leaf rating span the efficiency of tires currently sold in California and distribute most of those tires into the middle leaf categories (Table 2-3).

Table 2-3: Proposed California Tire Efficiency Rating System

CEC Tire Efficiency Rating	Passenger Vehicles and Light-Duty Trucks
Fuel Efficiency Class	**RRC in N/kN**
	<= 6.5
	6.6 - 7.7
	7.8 - 9.0
	9.1 - 10.5
(No Rating)	>= 10.6

Source: CEC staff.

Relative Wet Grip Braking Performance Index Performance Standard

PRC sections 25770–25773 stipulate that the RTEP must not adversely affect tire safety, and relative wet grip braking performance (traction) is a characteristic of tires that the proposed regulations use as a measure of tire safety. The federal government requires manufacturers to imprint a UTQG system traction rating on the side of tires that indicates a tire's ability to stop on wet pavement. The proposed RTEP will include a relative wet grip braking performance index performance standard that would better indicate a tire's ability to stop on wet pavement for vehicles equipped with modern braking and handling systems. Under these regulations, new replacement tires manufactured on or after January 1, 2028, that are sold in California would be required to meet a relative wet grip braking performance index performance standard of 1.0.

2.4.1 Regulatory Framework

The proposed regulatory framework for the RTEP would add Chapter 14, Article 1 into Division 2 of Title 20 of the California Code of Regulations, commencing with section 3300.

The project proposes to add the following sections to Title 20:

- 3301: Scope
- 3302: Definitions
- 3303: Testing Specifications
- 3304: Database of Replacement Tires and Limited Production Tires
- 3305: Submitting Tire Information to the Database
- 3306: Energy Performance Standards
- 3307: Energy Efficiency Rating for Replacement Tires
- 3308: Relative Wet Grip Braking Performance Index Performance Standard
- 3309: Compliance and Verification
- 3310: General Administration

2.4.2 Applicability of Proposed Regulations

The proposed RTEP regulations would apply to all tire retailers, tire manufacturers, and tire brand name owners of any new tire that is sold or offered for sale in California, except as wholesale for final retail sale outside of the state, that is designed to replace a tire on a new passenger car or light-duty truck.

2.4.2.1 Tires Subject to the Proposed Regulations

The proposed regulations apply only to "replacement tires" defined as a new tire sold or offered for sale in California, except as wholesale for final retail sale outside the state,

and is designed to replace a tire on a passenger car or light-duty truck. "Replacement tire" does not include any of the following tires:

(1) a retreaded tire
(2) a used tire;
(3) a deep tread tire;
(4) a winter-type snow tire;
(5) a space-saver tire;
(6) a temporary use spare tire;
(7) a tire with a nominal rim diameter of 12 inches or less;
(8) a motorcycle tire;
(9) a tire manufactured specifically for use on an off-road motorized recreational vehicle;
(10) a limited production tire;
(11) a tire with a load index of 122 or greater, or where the load index is not marked and the tire is rated for a maximum load that exceeds 1,450 kilograms; or
(12) a tire that is not capable of maintaining sustained speeds of greater than 50 miles per hour.

The proposed standards also offer an exemption for tires used on emergency vehicles. Used and retreaded tires do not fall under the scope of the proposed regulation.

The RTEP defines "passenger car" to mean any 4-wheeled motor vehicle designed primarily for transporting persons, having a design capacity of 10 persons or fewer, and not exceeding a 10,000-pound gross vehicle weight rating (GVWR). This definition is based on the CARB's definition of "passenger car"[17] and modified to add a GVWR limit of 10,000 pounds to align with the weight limit definition of "passenger car tire" in the federal Tire Fuel Efficiency Consumer Information Program.[18] The definition of "passenger car" would be subject to the RTEP's proposed definition of "motor vehicle," which includes only vehicles designed primarily for driving on public streets, roads, and highways, which aligns with the federal definition.[19]

The RTEP defines "light-duty truck" to mean any motor vehicle other than a motorcycle, trailer, or passenger car that has a design capacity not exceeding 10,000 pounds GVWR. Thus, the definition of "light-duty trucks" complements the definition of "passenger car" to comprehensively encompass all motor vehicles designed primarily for driving on public streets, roads, and highways that have a GVWR limit of 10,000 pounds

[17] 13 CCR § 1900(b)(17).

[18] 49 CFR § 575.106(d)(2).

[19] See 49 U.S.C. § 32101(7) (NHTSA definition of "motor vehicle"); see also 49 CFR § 523.3 (NHTSA definition of "automobile.")

or less. These definitions provide clarity on which tires are within the scope of the regulations.

The scope of tires covered by the RTEP as "replacement tires" is necessarily broader than the tires covered by the federal Tire Fuel Efficiency Consumer Information Program because PRC section 25770(a) expressly includes tires designed for use on "light-duty trucks," whereas the federal program expressly excludes "light truck tires."[20] The scope of the federal consumer information program is defined to regulate "passenger car tires," even if they are intended for multipurpose passenger vehicles or trucks,[21] including "smaller sport utility vehicles (SUVs), pickup trucks, and vans," which NHTSA classifies as light trucks.[22] The federal program excludes tires that are intended primarily for light- and medium-duty trucks, including full-size pickups and vans, which are commonly used in commercial service, have a GVWR of more than 6,000 pounds, and usually have the letters "LT" molded into the sidewall.[23] These LT tires would be included in the RTEP if they are designed for a vehicle with of GVWR of up to 10,000 pounds.

Limited production tires are only subject to the reporting requirements of the proposed regulation. Tires of "last resort," including tires that are unavailable in sufficient quantities for a specific vehicle model operated in California that would comply with the RTEP's performance standards, would also be only subject to reporting requirements. Limited production tires and tires of last resort would be included in the proposed publicly available online database (see Section 2.4.5, below). This would provide a way for tire retailers to verify that a tire complies with the proposed regulations and is legal for sale in California. Additionally, the reporting requirement allows tire manufacturers to demonstrate that a given tire is limited production in order to be exempted from the RTEP's tire efficiency regulations.

2.4.2.2 Tire Manufacturers Subject to the Proposed Regulations

The proposed regulations would apply to all manufacturers of any "replacement tire" and limited production tire sold or offered for sale in California except as wholesale for final retail sale outside the state. Manufacturers of limited production tires are required to report which of their tires are limited production.

A "tire brand name owner" would be allowed to stand in for a manufacturer for tires marketed under a brand name different from the manufacturer's name. The federal Tire Fuel Efficiency Consumer Information Program similarly allows brand name owners to stand in as a manufacturer under its program.[24] The proposed RTEP would adopt the

[20] 49 CFR § 575.106(c); 49 U.S.C. § 32304A(a)(3).

[21] 49 U.S.C. § 32304A(a)(3).

[22] NHTSA Tire Fuel Efficiency Consumer Information Program, Final Rule (Mar. 30, 2010) 75 FR 15894-01, 2010 WL 1186165, 15908.

[23] Ibid.

[24] See 49 CFR § 575.106(d)(2) (definition) and (e) (requirements).

federal program definition of "brand name owner," which is a person or entity, other than a tire manufacturer, who owns or has the right to control the brand name of a tire or who licenses another to purchase tires from a tire manufacturer bearing the licensor's brand name.

2.4.2.3 Tire Retailers Subject to the Proposed Regulations

The proposed definition of "tire retailer" is a dealer or distributor of a replacement tire or limited production tire that is sold or offered for sale in California. This definition is intended to apply to all places where customers may purchase tires, including internet and mail-order companies, tire dealers, manufacturer outlets, or retail department stores. This definition aligns with the scope of businesses covered under the federal Tire Fuel Efficiency Consumer Information Program.

2.4.2.4 Data Subject to Collection Under the Proposed Regulations

The proposed RTEP would require tire manufacturers to report tire data to the CEC for every replacement tire base model sold in the state. This information would include the identity and contact information of the manufacturer, brand name owner if any, and the following information:

- tire manufacturer or brand name owner
- brand name
- model name
- DOT tire identification number (first nine digits)
- tread and sidewall ply and material identification
- load index
- speed rating
- UTQG traction, treadwear, and temperature ratings
- tire size designation
- tire energy efficiency rating
- EU correlated rolling resistance coefficient
- other applicable tire category qualifications
- relative wet grip braking performance index information
- tread depth
- manufacture year

The information listed in this section would allow consumers to compare tires when using the energy efficiency rating system, as listed in the CEC's online database. This would provide consumers the information necessary to make informed decisions regarding energy efficiency, which is consistent with the mandates of PRC sections 25770–25773 (Blackburn et al. 2026, Chapter 5).

2.4.3 Manufacturer Reporting Requirements

The proposed RTEP includes a requirement for manufacturers to report the information described in Section 2.4.2.4. The RTEP would allow each tire manufacturer to self-certify the ratings for its tires related to rolling resistance, relative wet grip braking performance (traction), and treadwear, and submit actual test documentation when requested. Test laboratories must be certified according to and in compliance with the test procedures identified in the regulations for RRC, including alignment as a testing laboratory, load index, speed rating and UTQG ratings. The test procedures in the regulations are the standards that the CEC would also use for compliance testing. Manufacturers would be required to exercise due care in certifying their tires.

2.4.4 Testing Procedures

2.4.4.1 Testing Procedures for Rolling Resistance

The proposed RTEP would require use of the tire rolling resistance test procedure, ISO 28580:2018, and specified testing conditions. This test measures rolling resistance of a tire by running it on a test wheel under load and at constant speed. The energy consumed by the rolling tire is directly proportional to the reaction forces in the form of torque on the test wheel, or force on the axle. The less force a tire needs indicates a more fuel-efficient tire. The ISO 28580:2018 test also states a procedure to correlate results between different test equipment. The CEC may consider adopting an updated version of the ISO test as part of the RTEP if the regulation is revisited for possible amendments in the future.

2.4.4.2 Testing Procedure for Relative Wet Grip Braking Performance Index Coefficient

The proposed RTEP includes adoption of the ISO 23671:2021 wet traction testing procedure to verify relative wet grip braking performance. Under the ISO 23671:2021 test, the relative wet grip braking performance index is a measure of how quickly a tire can stop on wet roads compared to a reference tire, and is widely used as an indicator of safety. A wet grip index value of 1.0 means the test tire stops within the same distance as the reference tire on a wet surface, a value above 1.0 indicates the test tire stops in a shorter distance, and a value below 1.0 means the test tire stops at a further distance compared to the reference tire. To assure safety of all replacement tires, these regulations set a relative wet grip braking performance index performance standard requirement of 1.0 based on the ISO 23671:2021 test. All replacement tires that do not meet a 1.0 wet grip requirement will not be legal for sale in California (Blackburn et al. 2026, Chapter 7). The RTEP would align with international test procedures to not create an undue burden on manufacturers worldwide.

2.4.5 Database

PRC section 25771(a) requires the CEC to develop a database of the energy efficiency of replacement tires sold in the state. The proposed RTEP includes an online database containing the data submitted and certified from tire manufacturers through the reporting required in these regulations. Additionally, the database would allow certain data to be accessible to the public, including tire consumers. It would provide, among other things, a means to compare the variety of rolling resistance characteristics found in the replacement tire market. The database would be continually updated with new information from tire manufacturers.[25]

2.5 Feasibility

The CEC conducted extensive analysis to verify the technical feasibility of the proposed RTEP regulations. This analysis focused on the following three key areas of concern identified in PRC section 25773(a)(1)(A) through (C):

1. The feasibility of achieving the proposed tire efficiency minimum performance standards.
2. Ensuring the regulations would not compromise tire safety.
3. Confirming the regulations would not reduce tire life.

2.5.1 Feasibility of Proposed Tire Efficiency Standards

Testing commissioned by CEC staff and conducted by tire consultancy Smithers demonstrates that the goal of having replacement tires be as efficient as OE tires is technically feasible. The testing evaluated rolling resistance values across OE and replacement tires, including tires marketed as efficient. Results showed that while OE tires are more efficient than replacement tires on average, there are already several replacement tire models in the market that match or exceed the average OE tire efficiency level.

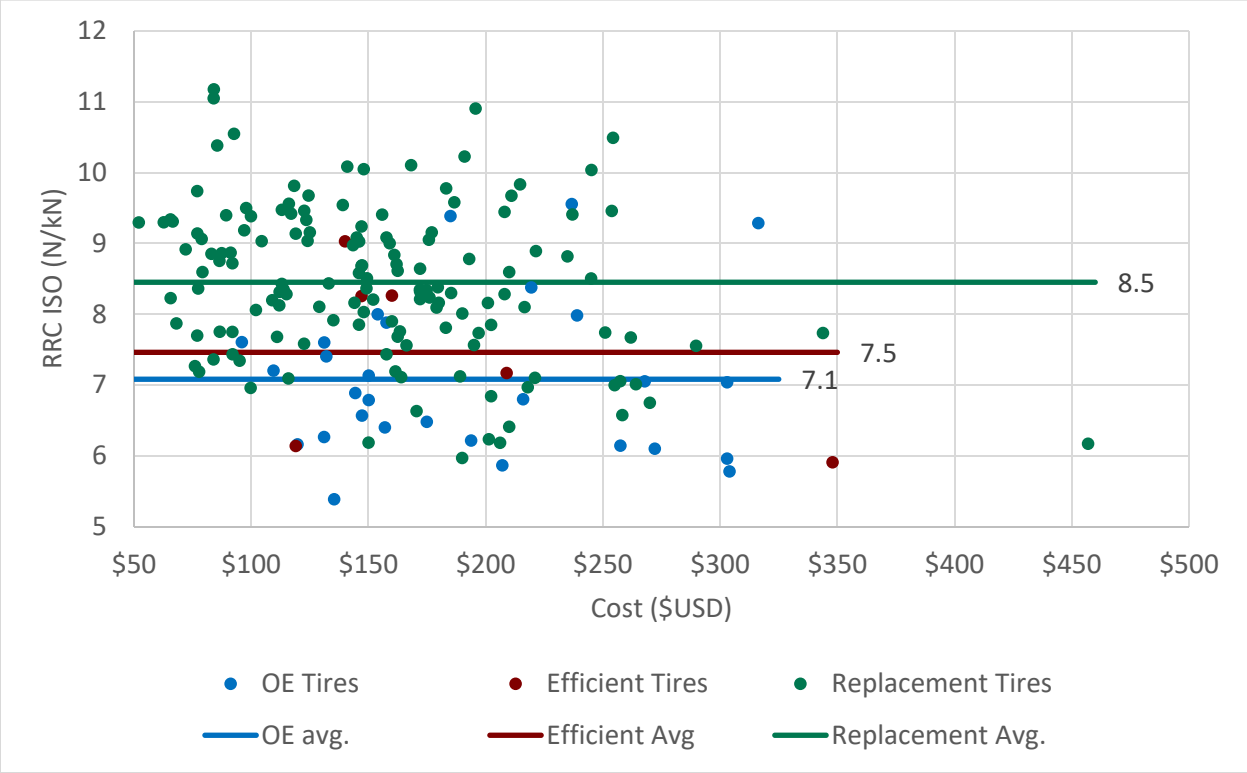
As shown in Figure 2-1, the average RRC values for different tire categories were as follows:

- OE tires: 7.1
- Tires marketed as efficient: 7.5
- Replacement tires: 8.5

A lower RRC represents a more efficient tire. The presence of replacement tires that already achieve RRC values comparable to OE tires demonstrates the technical feasibility of the proposed standards.

[25] See PRC § 25320(b)(3).

Figure 2-1: CEC Tire Test Program Results of RRC vs. Cost



Source: California Energy Commission, Fuels and Transportation Division

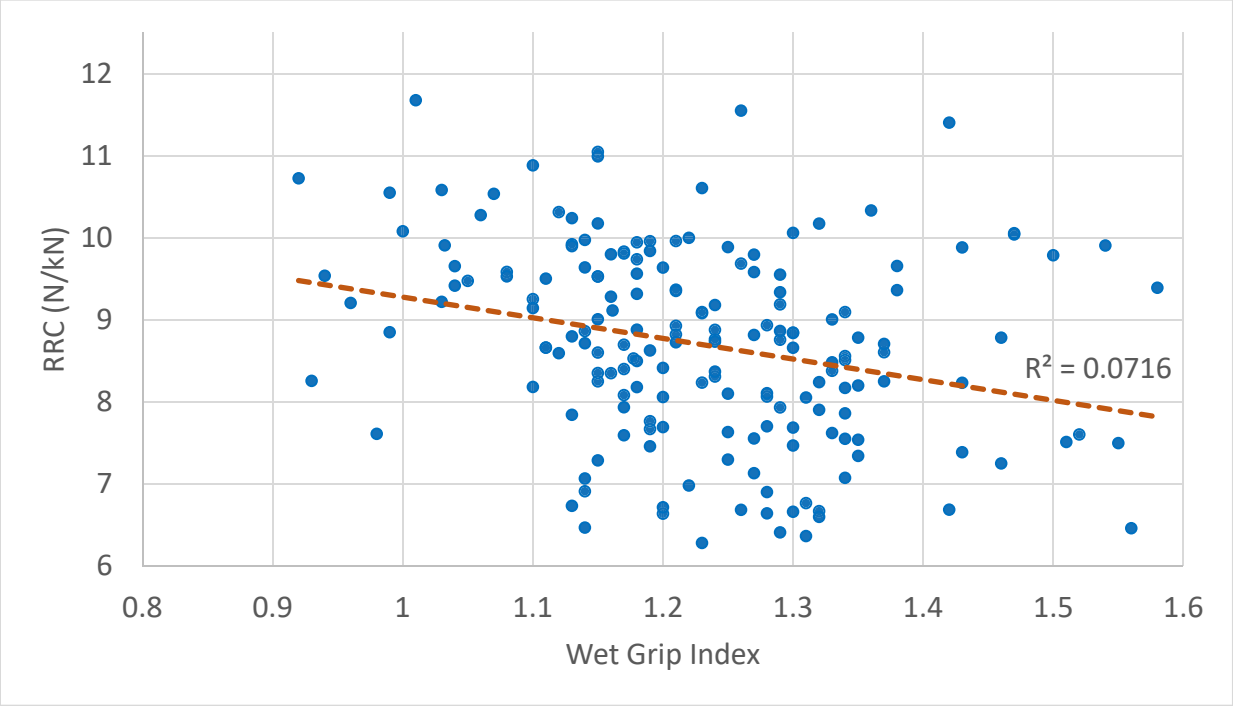
2.5.2 Safety Considerations

The CEC's analysis found that implementing the RTEP regulations would not compromise tire safety (Blackburn et al. 2026, Chapter 7). The key safety indicator examined was wet grip, or the ability of the tires to stop on wet surfaces.

CEC staff found no published evidence that lower-rolling-resistance tires showed significant declines in wet grip or other safety measures. Modern tire design and composition advances, such as the use of silica compounds in tire tread, have minimized or eliminated historical trade-offs between efficiency and relative wet grip braking performance (traction).

Analysis of 179 tire models tested by Smithers examined the relationship between rolling resistance and wet grip performance. As shown in Figure 2-2, the data demonstrated no clear correlation between tire efficiency and wet grip (indicated by a low R^2 value). Many tire models achieved both high efficiency and high wet grip ratings, confirming manufacturers can produce tires meeting both criteria.

Figure 2-2: RRC vs. Wet Grip Index



Source: California Energy Commission, Fuels and Transportation Division

Additional analysis of worn tire performance using data from Discount Tire's Treadwell database further validated these findings. Testing showed no clear relationship between tire RRC and wet stopping distance for worn tires, indicating that efficiency improvements do not necessarily impact safety performance even under challenging conditions.

To ensure safety is not adversely affected, the RTEP includes the following:

- A relative wet grip braking performance index minimum performance standard of 1.0
- Higher RRC allowances for ultra-high-performance tires that require enhanced wet grip
- Testing requirements for the peak coefficient of friction to ensure safety across vehicles with different braking technologies

2.5.3 Tire Life and Durability

The CEC's analysis found no inherent trade-off between tire efficiency and longevity that would reduce tire life under the proposed regulations (Blackburn et al. 2026, Chapter 7). Staff examined the relationship between tire efficiency and UTQG treadwear ratings, which indicate expected tire life. While data showed a general trend of longer-wearing tires having slightly lower efficiency, the low correlation coefficient (R^2=0.0194) does not show a statistically significant nor causal relationship. CEC staff also examined the relationship between tire efficiency and mileage estimates with data from Discount

Tire's proprietary Treadwell database. Again, the results did not show a statistically significant relationship between Treadwell mileage (a higher rating represents a longer tire life) and RRC (a lower RRC represents a more efficient tire). Many tire models demonstrate both low RRC and high UTQG treadwear grades, or both low RRC and high Treadwell mileage estimates, showing that existing tires can achieve efficiency and without sacrificing tire life.

The effect of tire efficiency regulations must account for any potential increase or decrease in the volume of tire disposal and recycling. Tire testing conducted for *California's Proposed Replacement Tire Efficiency Program* showed no strong correlation between tire efficiency and treadwear, meaning efficient tires do not necessarily equate to a shorter tire life (Sellers et al. 2023). Existing literature on treadwear and efficiency from the National Research Council, CalRecycle, and National Highway Traffic Administration confirm that there is no meaningful relationship between treadwear and efficiency (see Blackburn et al. 2026, Chapter 7). Thus, there is no expected change in the useful life of the tire as a result of the tire efficiency regulations of the RTEP. Therefore, there is no expected increase, nor decrease, in the volume of tires in need of disposal under the RTEP, and the proposed regulation is not expected to result in higher incremental costs for recycling and waste disposal of energy-efficient tires. As such, the program should not affect state efforts to manage the scrap tire program.

The regulation design itself also decreases the potential impacts on tire life. The RTEP includes the following:

- More lenient RRC standards for long-life and ultra-long-life tires to encourage tire manufacturers to continue to increase tire lifespans
- Phased implementation to allow manufacturers time to optimize designs
- Based on this analysis and consultation with CalRecycle staff, the CEC found no evidence that the proposed MPSs would adversely impact tire life or the state's scrap tire management program.

2.5.4 Achievement Methods

Manufacturers can achieve the required efficiency improvements through various established methods, including the following:

- Optimizing tire design to minimize deformation and energy loss
- Modifying tire dimensions such as height, width, and diameter
- Adjusting tread design parameters
- Developing improved rubber compounds with lower hysteresis[26]
- Incorporating or increasing materials such as silica to improve efficiency while maintaining relative wet grip braking performance

[26] Hysteresis refers to the energy loss that occurs when a tire deforms and then returns to its original shape as it rolls. Lower hysteresis means less energy is lost, which improves fuel efficiency and reduces tire wear.

The technical feasibility analysis demonstrates that the proposed regulations can be implemented using existing technologies and manufacturing methods while maintaining tire safety and longevity. The presence of compliant tires already in the marketplace provides further evidence of technical feasibility.

2.6 Intended Uses of This EIR

As the lead agency pursuant to CEQA, the CEC is responsible for the preparation of this EIR. The CEC will use this EIR in support of its discretionary decision to approve the RTEP. No other agencies will need to issue approvals or permits for the RTEP other than CEC. Therefore, there are no responsible agencies for the CEQA review of the RTEP that will need to use this EIR as part of its decision making for the project.

The California Department of Fish and Wildlife is California's trustee agency for the state's fish, wildlife, and plant resources, and it may consider and comment on the Draft EIR in fulfillment of its duties. No other agency is expected to use the EIR, and no other permits or approvals are necessary for the approval of the RTEP.

In developing the EIR, consultation was only required with tribes that have requested such engagement. No other review or consultation is required.

2.7 References

Blackburn et al. 2026 – Blackburn, Bill, Julie Burbridge, Andrew Hom, Ralph Lee, Ken Rider, David Sakai, Sebastian Serrato, and Rachel Shuen. 2026. *California's Proposed Replacement Tire Efficiency Program*. California Energy Commission. Publication Number: CEC-600-2026-012.

CEC 2003a – CEC (California Energy Commission). 2003a. *California State Fuel Efficient Tire Report: Volume I, Summary of Findings and Recommendations*. California Energy Commission. Publication Number: 600-03-001F.

CEC 2003b. *California State Fuel Efficient Tire Report: Volume II, Consultant Report*. California Energy Commission. Publication Number: 600-03-001CR.

CEC and CARB 2003 – CEC and CARB (California Energy Commission and California Air Resources Board). 2003. Joint Agency Report: *Reducing California's Petroleum Dependence*. Publication Number: P600-03-005F.

Sellers et al. 2023 – Sellers, Bradley, Bruce Lambillotte, and Joshua Guilliams. January 2023. "Summary of Tire Testing for California's Replacement Tire Efficiency Program, per Assembly Bill 844." Smithers. File No. F49432BSR.

Chapter 3

ENVIRONMENTAL SETTING, IMPACTS, AND MITIGATION

3 Environmental Setting, Impacts, and Mitigation

As described in Chapter 2, *Project Description*, CEC staff proposes to adopt the Replacement Tire Efficiency Program (RTEP), which seeks to improve the energy efficiency of replacement tires through the establishment of minimum performance standards for replacement tires for passenger cars and light-duty trucks sold in California to ensure, to the extent feasible, that they are at least as energy-efficient as the tires sold as original equipment on new vehicles. The RTEP also proposes to improve consumer access to information on the energy efficiency of replacement tires.

This chapter provides an environmental analysis of the physical impacts that could occur as a result of implementing the proposed RTEP. The chapter is organized into separate sections for each resource/area selected for analysis, as listed below.

- Utilities and Service Systems: Solid Waste
- Hazardous Materials
- Air Quality
- Biological Resources

The following subsections are included in each resource section:

- **Environmental Setting** describes the existing or baseline conditions of the resources in the study area (California).
- **Regulatory Setting** describes existing plans, policies, statutes, and regulations relevant to the topic and the project.
- **Environmental Impacts** describes the methodology and criteria used to determine the significance of potential impacts, using the questions in the State CEQA Guidelines, Appendix G. For each potential impact, the CEC staff have made a determination regarding the significance of the impact (no impact, less-than-significant impact, less-than-significant impact with mitigation, or significant and unavoidable impact).

A discussion of the project's potential contribution to cumulative impacts addressing each of the topic areas in Sections 3.1 through 3.4, is included in the Mandatory Findings of Significance Section 4.4 of Chapter 4, *Other Discussions*.

The CEC staff evaluated several additional environmental topics and concluded that there is no substantial evidence that the new regulations included in the RTEP would have the potential to cause or otherwise result in significant environmental impacts related to those topics. These topics are discussed in Appendix A, *Initial Study.* For each of these environmental topics, the Initial Study in Appendix A provides a brief statement of the reasons for concluding that the project would not result in environmental

impacts, using questions from Appendix G of the State CEQA Guidelines.[27] These environmental topics include the following:

- Aesthetics
- Agriculture and Forestry Resources
- Cultural and Tribal Cultural Resources
- Energy
- Geology and Soils
- Greenhouse Gas Emissions
- Hydrology and Water Quality
- Land Use and Planning
- Mineral Resources
- Noise
- Population and Housing
- Public Services
- Recreation
- Transportation
- Utilities and Service Systems (excluding solid waste)
- Wildfire

The impact analysis in this chapter is based on the description of the proposed RTEP presented in Chapter 2, *Project Description*. In addition, the CEC staff have made assumptions about the proposed RTEP that influence the environmental impacts analysis. The key assumptions used in the analysis are described below.

- **Driving Habits.** The analysis in this EIR assumes that the driving habits of Californians will not change due to the RTEP and that there will be no change in miles driven on California's roadways as a result of the implementation of the RTEP. This assumption is valid because the changes in tire efficiency mandated by the RTEP would be essentially undetectable to drivers except in that they may notice a modest improvement in fuel economy compared to previously installed replacement tires. CEC staff does not expect these modest fuel savings, which are estimated to be about 39 gallons (roughly $179) over the lifespan of a set of efficient lighter vehicle tires, to induce consumers to drive more frequently than with less fuel-efficient replacement tires (Blackburn et al. 2026, Chapter 8).
- **Tire Safety.** The analysis assumes that the more efficient tires mandated by the RTEP will be just as safe as replacement tires currently sold in California. This assumption is valid because the RTEP would only require lower rolling resistance for replacement tires and would not require any changes to tire design that are intended to make tires safe and reliable. AB 844 (Nation, Chapter 645, Statutes of 2003), codified at Public Resources Code (PRC) sections 25770–25773, stipulates that the RTEP must not adversely affect tire safety, which is a characteristic of tires that is used as a measure of tire safety. The RTEP proposes a relative wet grip braking performance standard in addition to the energy performance standards.

[27] California Public Resources Code (PRC) § 21100(c) states EIRs shall "contain a statement briefly indicating the reasons for determining that various effects on the environment of a project are not significant and consequently have not been discussed in detail in the environmental impact report." See also State CEQA Guidelines § 15128, which states "An EIR shall contain a statement briefly indicating the reasons that various possible significant effects of a project were determined not to be significant and were therefore not discussed in detail in the EIR."

- **Fuel Economy.** The purpose of the RTEP is to improve the efficiency of replacement tires for passenger vehicles and light-duty trucks by providing a minimum performance standard for rolling resistance. More efficient replacement tires will improve the fuel efficiency of vehicles, resulting in reduced fuel consumption. Estimates of expected fuel savings are presented in Section 3.5, *Environmental Benefits*.
- **Air Pollutant and GHG Emissions.** As stated above, more efficient replacement tires will improve the fuel efficiency of vehicles, which will reduce air pollutant emissions generated from fuel combustion in engines. Similarly, greenhouse gases (GHG) from both vehicle exhaust and upstream fuel production emissions would also be reduced. Reduced upstream emissions associated with electric vehicles would also be realized as electric vehicles would be able to go farther on a single charge with more efficient tires.
- **Tire Noise.** This analysis assumes that the noise generated by tires as they roll over pavement would not be changed by the RTEP. The regulations are not expected to cause manufacturers to fundamentally change the design and composition of tires that would likely result in increased road noise (Sellers et al. 2024).[28] As a result, the noise generated by the tires of passenger vehicles and light-duty trucks on California's road would not change as a result of the regulations.
- **Tire Composition.** As many as two hundred different materials are combined to produce tires. These materials include natural rubber, synthetic rubber, steel, textiles (rayon, polyester, aramid, and nylon), fillers (carbon black, silica), and various additives, such as processing additives, vulcanizing additives, and antioxidants. It is possible that tire manufacturers will develop compounds that help reduce the rolling resistance of replacement tires; however, the exact nature of such changes cannot be predicted and will undoubtedly vary among manufacturers. One particular chemical of current concern found in tire rubber is 6PPD,[29] which is an antidegradant used to improve the durability of tires (see discussions in Sections 3.2 and 3.4). The amount of 6PPD used in tire rubber is not expected to change as a result of the RTEP regulations because the use of 6PPD does not affect the rolling resistance of tires. 6PPD helps keep tire rubber from degrading, but it does not have a role in reducing rolling resistance. Tire manufacturers would have no reason to change the amount of 6PPD in tires to conform to the RTEP regulations. With both state and federal regulators looking at safer alternatives to 6PPD, it is likely that this compound will either be phased out or used in limited volumes.

[28] Reduced hysteresis, which reduces rolling resistance, does not have to be indicative of a noisier tire. An increase in reduced hysteresis tread usage for replacement market tires would not be expected to generate more road noise (Sellers et al. 2024).

[29] N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine

- **Tire Wear.** PRC sections 25770–25773 direct the CEC to develop and adopt minimum energy efficiency standards for replacement tires that, among other things, do not adversely affect the average life of replacement tires. To meet this requirement, the RTEP has also expanded the minimum performance standards to avoid sacrificing wear resistance in replacement tires. The rolling resistance coefficient (RRC) minimum performance standard (MPS) has been relaxed for certain categories of tires, including long-life and ultra-long-life tires. This eased standard for rolling resistance will ensure that long-life replacement tires remain available to California consumers under the RTEP regulations and ensure that replacement tires do not wear out more quickly, on average, than replacement tires currently available.

Summary of Conclusions

The table below summarizes the primary conclusions of the analysis in Sections 3.1 through 3.5 of this chapter.

Topic	Summary of Conclusions
Solid Waste	• CEC staff found no inherent trade-off between tire efficiency and wear resistance (indicative of expected tire life). Because the proposed RRC MPS has been crafted with the intent of avoiding any significant decrease in useful tire life, the RTEP is not likely to cause replacement tires to wear out more quickly and, therefore, will not increase the amount of scrap tire waste. • The RTEP is not likely to cause an increase in stockpiling or discarding of replacement tires that do not meet the proposed minimum efficiency and relative wet grip braking standards and, therefore, will not negatively impact state efforts to manage scrap tires pursuant to the California Tire Recycling Act. • Implementation of the RTEP is not expected to result in any significant adverse impacts related to solid waste.
Hazardous Materials	• The RTEP is not likely to cause an increase in the use of additives that do not improve the rolling resistance of tire rubber, including antiozonants like 6PPD.[30] • Because the proposed RRC MPS has been crafted with the intent of avoiding any significant increase in tread wear, the RTEP is not likely to result in an increase in the shedding of TWPs that can release harmful chemicals into the environment. • Implementation of the RTEP is not expected to result in any significant adverse impacts related to hazardous materials.
Air Quality	• The RTEP is not expected to cause an increase in vehicle exhaust or tire wear emissions because the RRC MPS has been crafted to

[30] N-(1,3-dimethylbutyl)-N′-phenyl-p-phenylenediamine

Topic	Summary of Conclusions
	improve fuel efficiency and avoid any significant increase in tread wear. • Implementation of the RTEP would not substantially increase motor vehicle exhaust or tire wear emissions. • Implementation of the RTEP is not expected to result in any significant adverse impacts on air quality.
Biological Resources	• Because the proposed RRC MPS has been designed to avoid any significant increase in tread wear, the RTEP is unlikely to result in increased shedding of TWPs that can release harmful chemicals into the environment and adversely affect wildlife or habitat. • Implementation of the RTEP is not expected to result in any significant adverse impacts on biological resources.
Environmental Benefits	• Implementation of the RTEP is anticipated to reduce GHG emissions by an estimated 2.0 million metric tons (MMT) of carbon dioxide equivalent (CO2e) annually starting in 2035. • Implementation of the RTEP is expected to improve air quality by reducing the emissions of criteria air pollutants such as oxides of nitrogen (NOx) and fine particulate matter (PM2.5). The estimated annual reduction in 2035 is 426 tons of NOx and 10 tons of PM2.5. • The RTEP will reduce other criteria pollutants associated with fuel combustion, including such as sulfur oxides (SOx) and ozone. • The RTEP is expected to save 3.4 million gallons of diesel, 141.1 million gallons of gasoline, 0.9 terawatt-hours of electricity, and 0.5 million kilograms of hydrogen annually by 2035, contributing to reduced energy consumption and lower emissions from electricity generation.

Speculation

In evaluating the significance of the environmental effects of a project, the lead agency must consider direct physical changes in the environment that may be caused by the project and reasonably foreseeable indirect physical changes in the environment which may be caused by the project. Preparation of an EIR involves some degree of forecasting regarding future conditions and the anticipated consequences of a proposed project. However, as discussed in Section 15145 of the State CEQA Guidelines, some impacts can be too speculative for evaluation. If the lead agency finds that excessive speculation is required to evaluate an impact, it should note this conclusion and terminate discussion of the impact.

As stated in State CEQA Guidelines Section 15064(d)(3), an indirect physical change in the environment is to be considered only if that change is a reasonably foreseeable

impact that may be caused by the project. A change that is speculative or unlikely to occur is not reasonably foreseeable.

In the case of this EIR, it is not possible to know exactly what steps manufacturers will take to meet the requirements of the RTEP. It is anticipated that tire manufacturers will achieve reduced rolling resistance using methods like those already employed for existing energy-efficient replacement tires and energy-efficient original equipment (OE) tires. The methods employed will likely vary among manufacturers, reflecting either existing methods already utilized by that manufacturer or the results of new research and development in tire design, tire construction, or tire rubber formulation. Additionally, manufacturers may initially adopt one compliance strategy and subsequently modify it in response to technological advancements, market dynamics, or changes in production capacity across manufacturing facilities. The exact nature of such changes cannot be predicted and will undoubtedly vary among manufacturers.

Degree of Specificity

As described in Section 15146 of the State CEQA Guidelines, the degree of specificity required in an EIR will correspond to the degree of specificity involved in the underlying activity evaluated in the EIR. An EIR for a construction project will be more detailed in the evaluation of project's specific effects than an EIR for a programmatic action such as the adoption of regulations like those of the RTEP. This is because the effects of a construction project can be predicted with greater accuracy. An EIR on a project such as the adoption of regulations should focus on the secondary effects that can be expected to follow from the regulations, but the EIR need not be as detailed as an EIR for a construction project.

Significance Thresholds

Section 15064.7 of the State CEQA Guidelines encourages lead agencies to use thresholds of significance to aid in determining whether an identified impact is significant. A threshold of significance is a standard or performance level against which a project's impacts can be evaluated to assess whether the impacts are significant and therefore require mitigation to reduce the severity of the impacts. Significance thresholds can be quantitative or qualitative. The CEC has not adopted thresholds for use in the determining of the significance of environmental impacts. In such situations, the questions on the environmental checklist form in Appendix G of the State CEQA Guidelines are often used to assess the significance of a project's environmental impacts. In the case of this EIR, the questions in Appendix G are the thresholds used to make significance conclusions for the impacts of the proposed RTEP.

Economic and Social Effects

In accordance with State CEQA Guidelines Section 15131, the economic or social effects of a project cannot be treated as significant effects on the environment. However, an

EIR may trace a chain of cause and effect from a proposed decision on a project through anticipated economic or social changes resulting from the project to physical changes caused in turn by the economic or social changes. The intermediate economic or social changes need not be analyzed in any detail greater than necessary to trace the chain of cause and effect. The focus of the analysis shall be on the physical changes.

Cumulative Impact Analysis Scenario

The State CEQA Guidelines require a discussion of cumulative impacts when a project's incremental effect is cumulatively considerable. "Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.[31] State CEQA Guidelines Section 15355 defines a cumulative impact as two or more individual effects that, when considered together, are considerable or that compound or increase other environmental impacts. The geographic scope for the consideration of cumulative effects is the entire State of California as that is the area where the proposed RTEP regulations are applicable.

The State CEQA Guidelines state that both the severity of impacts and the likelihood of their occurrence are to be reflected in the discussion, "but the discussion need not provide as great detail as is provided for the effects attributable to the project alone. The discussion of cumulative impacts shall be guided by standards of practicality and reasonableness, and shall focus on the cumulative impact to which the identified other projects contribute rather than the attributes of other projects that do not contribute to the cumulative impact."[32]

For the analysis of cumulative effects, Section 15130(b)(1) of the State CEQA Guidelines indicates that one of two methods should be employed to establish a scenario for the evaluation of cumulative effects. These methods include the development of either: (1) a list of past, present, and probable future projects producing related or cumulative impacts, including, if necessary, those projects outside the control of the agency, or (2) a summary of projections contained in an adopted local, regional or statewide plan, or related planning document, that describes or evaluates conditions contributing to the cumulative effect.

The first method described in State CEQA Guidelines Section 15130(b)(1) is not practical nor particularly meaningful for the purposes of this EIR as it would require the development of a list of all past, present, and probable future projects across California that contribute to adverse effects on solid waste, hazardous substances, air quality, and aquatic organisms. Such a list would be prohibitively difficult to compile and likely would not provide any information that is more useful to the discussion of cumulative effects

[31] 14 California Code of Regulations (CCR) § 15065(a)(3).

[32] 14 CCR § 15130(b).

than the provision of descriptions of existing conditions and ongoing trends in the State related to those issues presented in Sections 3.1, *Utilities and Service Systems: Solid Waste*, 3.2, *Hazardous Materials*, 3.3, *Air Quality*, and 3.4, *Biological Resources*, which follow. The list method for identifying other projects that might contribute to cumulative effects is ostensibly intended for discrete, localized, ground-disturbing projects, such as construction projects, rather than programmatic actions such as the establishment of statewide regulations.

The second method described in Section 15130(b)(1) provides more value for the cumulative effects analysis because plans and policies exist for reducing the solid waste stream, improving air and water quality, and protecting or enhancing wildlife habitat. Such plans typically describe relevant issues and trends, and present goals for future improvement.

The relevant cumulative condition created by past projects is presented in the *Environmental Setting* subsections of Sections 3.1, 3.2, 3.3, and 3.4. The *Regulatory Setting* subsections of those same sections provide summaries of relevant information contained in adopted plans that are applicable to current and future projects. Those plans, and associated implementation programs and regulations, are intended to address projects, activities, and trends related to solid waste, hazardous materials, air quality, and biological resources that contribute to cumulative effects, with the intention of reducing adverse effects in the future.

3.1 Utilities and Service Systems: Solid Waste

3.1.1 Environmental Setting

In the context of the CEQA environmental checklist, the term "Utilities and Service Systems" refers to water, wastewater, storm water drainage, electrical power, natural gas, and telecommunications systems, as well as solid waste facilities. This section focuses on solid waste systems, including landfills, transfer facilities, and other facilities required for the collection and disposal of solid waste. Landfills may be public or private and solid waste collection services are often provided by private companies under a contract granted by county or city government.

CEQA's focus is on whether changes to these systems are needed to serve a proposed project. For example, the expansion or alteration of a solid waste facility may be needed if the implementation of a proposed project or regulation would cause an increase in waste streams. Such expansion or alteration of solid waste infrastructure typically involves new construction, which can have effects in the physical environment and potentially cause adverse environmental impacts. The consideration of solid waste impacts also asks whether implementation of a project would impair the attainment of public solid waste reduction goals or conflict with solid waste management and reduction regulations.

3.1.1.1 Used, Waste, Repairable, and Scrap Tires

The California Public Resource Code (PRC) defines a "used tire" as a tire that meets the following requirements. First, the tire is no longer mounted on a vehicle but is still suitable for use as a vehicle tire. Second, the tire meets applicable requirements of the Vehicle Code and Title 13 of the California Code of Regulations. Last, the used tire is ready for resale and is stored by size in a rack or a stack in a manner approved by the local fire marshal and vector control authorities and in accordance with state minimum standards to allow the inspection of each individual.[33]

A "waste tire" is a tire that is no longer mounted on a vehicle and is no longer suitable for use as a vehicle tire due to wear, damage, or deviation from the manufacturer's original specifications. A waste tire includes a repairable tire, scrap tire, altered waste tire, and a used tire that is not organized for inspection and resale by size in a rack or a stack in accordance with PRC section 42806.5 "Used Tires," but does not include a tire derived product or crumb rubber.[34, 35]

An "altered waste tire" is a waste tire that has been baled, shredded, chopped, or split apart, but does not mean crumb rubber. Types of altered waste tires include tires where the sidewalls and treads have been cut away from each other, tires that have been run through a shredder one time, and tires that have been run through a shredder more than once to create pieces two inches or smaller.[36]

A "repairable tire" is a worn, damaged, or defective used tire that is retreadable, recappable, or regrooveable, or that can be otherwise repaired to return the tire to its use as a vehicle tire, and that meets the applicable requirements of the Vehicle Code and Title 13 of the California Code of Regulations.[37]

Lastly, a "scrap tire" is considered to be a worn, damaged, or defective tire that is not a repairable tire.[38]

3.1.1.2 Tire Waste, Recycling, and Repurposing in California

According to CalRecycle's *2022 California Waste Tire Market Report,* the agency managed 601,024 tons of waste tires in 2022. This is comparable to 60.1 million passenger tire equivalents (PTEs).[39] CalRecycle reports the percentage of waste tires that end up in the following categories: landfill disposal (49.6 percent), crumb/ground rubber (13.0 percent), retreads (9.5 percent), used tires (8.2 percent), tire-derived fuels (both for export [6.2 percent] and in-state use [5.4 percent]), alternative daily cover

[33] PRC § 42806.5

[34] PRC § 42807

[35] Recycled rubber produced from waste or scrap tires.

[36] PRC § 42801.5.

[37] PRC § 42805.5.

[38] PRC § 42805.6.

[39] PTE means passenger tire equivalent, defined by CalRecycle (14 CCR § 17225.770) as 20 pounds.

(3.5 percent), other recycling (2.8 percent), tire-derived aggregates (1.2 percent), and baled waste tires and treads (0.6 percent) (CalRecycle 2024, ES-i).

Waste tire tonnage changes year to year due to boom/bust cycles in the economy, supply chain disruptions and logistical challenges, trucking and ocean shipping costs, and global marketplace changes. The continued infection waves of the COVID-19 pandemic can also disrupt specific workplaces and lead to staffing shortages that impact tire production, shipping, sales, disposal and recycling (CalRecycle 2024, 4-5).

Other influences on waste tire tonnage include economic factors, consumer behavior, and geographical considerations. During periods of high inflation, consumers tend to delay purchasing new tires unless absolutely necessary, which can indirectly reduce the number of waste tires entering landfills or recycling facilities. Additionally, new and used tire buying decisions are not always rational and can be influenced by emotions, style preferences, and brand loyalty. Geography also plays a significant role, as consumers choose tires based on their driving habits and local conditions. For instance, those living in areas with heavy rain or snowfall may opt for tires with deeper tread for better traction, while city commuters facing high gas prices might prefer tires that offer the best fuel economy.

From 2009 to 2022, the quantity of waste tires generated in California grew at an average of approximately three percent per year, from 412,117 tons in 2009 to 601,024 tons in 2022 (CalRecycle 2024, C-2). CalRecycle expects the yearly tonnage of waste tires in California to continue increasing due to growth in electric vehicle (EV) sales. EVs wear out tires faster than internal combustion engine (ICE) vehicles because they are heavier and have streamlined drivetrains, which exert more torque on tires during acceleration and regenerative braking (Recycled Rubber Coalition 2024).

Landfill Disposal

Per California Code of Regulations, Title 14, Section 17355, the landfill disposal of whole waste tires is banned in California. Waste tires that have been processed into crumb rubber and tire-derived aggregates (TDA), meaning they have been shredded and the shredded pieces have had steel and fibers removed, can be disposed of at landfills. In normal landfill conditions, disposal of processed tires poses little measurable risk to human health or the environment from leaching, outgassing, or biodegradation (Bolton 2024, 8). For example, a review of the environmental impacts of shredded scrap tires found that landfilled tire chips leached organic and inorganic compounds at concentrations lower than the Toxicity Characteristic Leaching Procedure (TCLP) limits that would classify it as a hazardous material (Edil 2008). The main way that tire particulates enter the environment is through pavement abrasion during vehicle use, which creates small tire wear particles (TWP) that are released into the air and washed into surrounding environs with water runoff (refer to Section 3.2.1.2) (Mayer et al. 2024). Therefore, there are no significant environmental concerns for compliant and processed tires that have been landfilled.

Landfill disposal of waste tires in California has seen a steady increase in recent years, with 95,412 tons (18.4 percent of total waste tires managed) disposed of in 2019, 479,017 tons (32.2 percent) in 2020, 249,377 tons (45.4 percent) in 2021, and 298,084 tons (49.6 percent) in 2022 (CalRecycle 2024, 8). This increase can be explained by the reduced demand for exported tire-derived fuel (TDF, a recycled tire product), caused by disrupted export economics and logistical feasibility from the COVID-19 pandemic and from some countries banning imported waste tires. CalRecycle expects international demand for TDF to increase in future years, which would divert some waste tire flows from landfills (CalRecycle 2024, 21).

TDA at landfills are most commonly used as alternative daily cover (ADC), where it is spread over the face of the landfill at the end of each day to control disease, litter, odors, scavenging, and fires. In 2022, 21,169 tons (2.1 million PTEs or 3.5 percent of all waste tires managed) were used as ADC. This amount is expected to remain stable in future years because there are several landfills in California that use tire shreds for ADC (CalRecycle 2024, 18).

In a white paper for this EIR (see Appendix E, *Waste Tire Disposal in California*), Blue Ridge Services Montana, Inc. analyzes waste tire disposal in California. Landfill disposal is scalable, with an estimated marginal cost of $21 per ton for adding waste tires in California. The average landfill tipping fee is around $69 per ton as of 2022—equating to less than $1 per tire. Even when considering processing and transportation, tire disposal costs at California landfills are relatively low. The author concludes that until viable and economical alternatives emerge, landfill disposal of waste tires will continue as the most-utilized choice in the waste tire management stream (Bolton 2024, 3).

Recycled and Repurposed Waste Tires

Used tire collection and processing for recycling and repurposing is a crucial step in promoting sustainability and reducing environmental impact. Through efficient collection systems, used tires are gathered from various sources like tire retailers, auto repair shops, and waste management facilities. These tires are then processed at specialized recycling facilities where they are cleaned, shredded, and sorted into reusable materials. Tire reuse broadly refers to the ways waste tires (i.e., tires that are no longer mounted to a vehicle) are repurposed for continued vehicle use or made into other usable products. By diverting used tires from landfills and turning them into valuable resources, tire reuse helps conserve natural resources, reduce greenhouse gas emissions, and support a circular economy (Tire Recycling Foundation 2024). Products created from waste tires include (Mayer et al. 2024, USTMA 2024a):

- retreaded tires
- crumb rubber and ground rubber (used for paving and chip seal surface treatments, landscape and playground surfaces, artificial turf infill, and rubberized building and floor materials)

- tire-derived aggregate (used as infill material for roadside embankments, retaining walls, stormwater infiltration galleries and other sustainable infrastructure projects, ADC at landfills, landscaping and playground mulch, and athletic surfaces)
- tire-derived fuel (used in cement kilns, pulp and paper mills, and utility boilers, the making of automotive parts, rubber mats for industrial and agricultural use, and eco-friendly footwear and fashion accessories)
- rubber-modified asphalt (RMA) (used to extend pavement life, reduce maintenance costs, reduce tire wear, and decrease road noise)

Tires are one of the most recycled and repurposed products in the country, with more than 250 million waste tires generated annually. The national tire repurposing rate has increased from 11 percent in 1990 to 79 percent in 2023, which has led to 94 percent of the scrap tires stockpiled in the U.S. being recovered for reusable purposes (USTMA 2021, USTMA 2024a). However, the generation of waste tires continues to outpace the recycling and reuse rate. Data contained in the U.S. Tire Manufacturers Association's *2023 End-of-Life Tire Management Report* show the beneficial end use rate for U.S. scrap tires to be 88 percent in 2015, 81 percent in 2017, 76 percent in 2019, 71 percent in 2021, and 79 percent in 2023 (USTMA 2024a, 6).

CalRecycle has informally adopted a 75 percent waste tire recycling goal, consistent with a statewide 75 percent recycling goal covering all waste materials mandated by AB 341 (Chesbro, Chapter 476, Statutes of 2011) (CalRecycle 2024, 22). The rate of recycled and repurposed waste tires in the state has remained fairly steady in recent years, with 182,438 tons (35.2 percent of total waste tires managed) recycled in 2019, 175,868 tons (36.7 percent) in 2020, 193,197 tons (35.0 percent) in 2021, and 208,777 tons (34.7 percent) in 2022 (CalRecycle 2024, 8). According to CalRecycle's *Five-Year Plan for the Waste Tire Recycling Management Program*, increasing the tire recycling rate from 35 percent to 75 percent will necessitate a combination of the following activities (CalRecycle 2023, 3-4):

- Identifying new waste tire uses and addressing existing barriers to increasing markets for waste tire products.
- Evaluating, assessing, and promoting emerging technologies that could result in additional tire recycling markets.
- Continuing efforts to increase marketing and outreach/education about tire-derived products.
- Increasing the amount of tire material used in tire-derived products and expansion of new uses in civil engineering applications.
- Continuing to provide incentives/grants/loans to expand markets and increase waste tire processing capacity to support new recycling markets.

Similarly, Blue Ridge Services Montana, Inc., notes that tire waste diversion in California falls short of the 75 percent goal for the following reasons: (1) many of the alternative uses for waste tires are not easily scalable, (2) end-use markets have not been fully developed, and (3) even though the state continues to provide financial incentives to create new technologies and markets for waste tires, for various reasons, many of those alternatives are simply not economically viable, especially when compared to the relatively low cost of landfilling (Bolton 2024, 3).

CalRecycle's *California Waste Tire Market Report* shows the future outlook and predicted trends for waste tire recycling and repurposing across the end-use categories (Table 3.1-1). According to the analysis, the agency expects the tonnage of recycled tire waste to increase, while the percentage of the total tire waste handled remains stable. Within the recycled tire waste category, CalRecycle predicts increases in the recycling rates for crumb rubber and ground rubber, and for tire retreads.

Table 3.1-1: The Outlook for California Waste Tire Recycling

Category	2022 Tons	2022 M PTEs	2022 % Total	Outlook Toward 2023
Retreads	57,366	5.7	9.5%	Stable after record-breaking years in 2021 and 2022, with expected growth to continue
Used Tires	49,112	4.9	8.2%	Used tires remain steady
Crumb Rubber and Ground Rubber	78,341	7.8	13%	Steady increase if infrastructure and rubber pavement placement continue to grow
Tire-Derived Aggregate	7,371	0.7	1.2%	Relatively steady landfill use, new grant-funded light rail projects 2023
Other Recycling	16,587	1.6	2.8%	Stable usage expected, 2022 saw some businesses closed or changed ownership
Total Recycling	**208,777**	**20.8**	**34.7%**	**Same percentage as 2022 although increased tonnage**
TDF (In-State)	32,457	3.2	5.4%	Stable rate of use for TDF, continued CARB analysis of feedstock
TDF (Export) and Bales	40,537	4.0	6.7%	Expected increases in exported TDF due to international demand
Landfill Alternative Daily Cover	21,169	2.1	3.5%	Slight increase, steady use at a few landfills
Total Disposal Related	**94,163**	**9.4**	**15.7%**	**Stable to slight increase, related to stable ADC usage and TDF export demand**
Landfill Disposal	298,084	29.8	49.6%	Slight increase, total tonnage managed and TDF export challenges influence the increase or decrease in landfill disposal
Overall Diversion	302,940	30.2	50.4%	Stable
Waste Tires Managed	601,024	55.2	100.0%	Slight increase based on strong economics, increasing passenger tire size and EV

Source: CalRecycle 2024, 26.

3.1.2 Regulatory Setting

Various existing regulations help reduce or avoid environmental impacts related to solid waste. The management of waste and scrap tires is primarily regulated at the state level; however, important federal legislation, including the Solid Waste Disposal Act of

1965 and the Resource Conservation and Recovery Act, influence how states handle these materials. Relevant state regulations include:

- **California Solid Waste Management and Resource Recovery Act of 1972.** This Act (SB 5, Nejedly-Z'Berg-Dills, Chapter 324, Statutes of 1972) established the California Integrated Waste Management Board (CIWMB) with the authority to manage, regulate, and create policy related to the handling, disposal, recycling, and reduction of solid waste. This included setting statewide minimum standards for solid waste handling and disposal. Under the Act, each of California's counties are responsible for developing comprehensive solid waste management and resource recovery plans.
- **California Integrated Waste Management Act of 1989**. This Act (AB 939 Sher, Chapter 1095, Statutes of 1989) directed the CIWMB and local agencies to maximize all feasible reduction, recycling, and composting options in order to reduce land disposal of solid waste, and required each city or county waste management plan to divert 25 percent of all solid waste from landfill or transformation facilities by 1995 and 50 percent by 2000. The Act, codified at Public Resources Code, Title 30, Section 40000 (et seq. 1989), established local enforcement agencies and comprehensive statewide system of permitting, inspections, enforcement, and maintenance for solid waste facilities. Local jurisdictions were authorized to set and collect fees for generated solid waste to be used for planning, implementing, and operating integrated waste management plans. The CIWMB was dissolved in 2010 and had its duties and responsibilities transferred to the Department of Resources Recycling and Recovery (CalRecycle). CalRecycle is a branch of the California Environmental Protection Agency (CalEPA) and is the state agency responsible for the management of waste and scrap tires.
- **Senate Bill 1322 (Bergeson, Chapter 1096, Statutes of 1989).** This bill established the Source Reduction Advisory Committee and Recycled Market Development Commission, and created a suite of waste recycling, recovery, reduction, and compost programs including the Retreaded Tire Program. The Retreaded Tire Program authorized the CIWMB to study the quality, performance, and market for retreaded tires, and develop regulations for the purchase of retreaded tires by the state.
- **Assembly Bill 341 (Chesbro, Chapter 476, Statutes of 2011).** This bill sets the policy goal that 75 percent of generated solid waste be source reduced, recycled, or composted by the year 2020. This was an increase over the original policy goal set by the California Integrated Waste Management Act of 50 percent reduced, recycled, or composted by the year 2000. The bill requires a business, defined to include a commercial or public entity, that generates more than four cubic yards of commercial solid waste per week or is a multifamily residential dwelling of five units or more to arrange for recycling services. This mandatory recycling law for businesses, public entities, and multi-family housing facilities

aims to further reduce greenhouse gas emissions and increase waste diversion away from landfills.

- **California Tire Recycling Act of 1990.** Assembly Bill 1843 (Brown, Chapter 974, Statutes of 1989), known as the California Tire Recycling Act, was passed to reduce the amount of used tires in landfills and to address the problems associated with the storage and disposal of used tires. The Act established a tire recycling program with the goals of reducing landfill disposal of used whole tires, recycling of tires into secondary uses, promoting secondary markets for used tire by-products, tire shredding, and promoting energy recovery. Notably, AB 1843 prohibited any person from transporting waste tires to, or accepting waste tires at, an unpermitted waste tire facility, in an effort to eliminate illegal dumping and unnecessary stockpiling of used tires.
- **Waste Tire Haulter Registration and Manifest Program.** In 1993, Senate Bill 744 (McCorquodale, Chapter 511, Statutes of 1993) gave CalRecycle further authority to regulate the storage, disposal, and hauling of waste tires. It defined what is considered a waste tire facility, and implemented permitting, applications, and planning procedures for waste tire facilities. The regulations specified procedures for waste hauler registration and implemented reporting and documentation requirements for waste tire haulers, generators, and facilities.
- **Title 14 California Code of Regulations Sections 17350-17359.** This section contains the waste tire storage and disposal standards for the state. A waste tire facility, including a permitted facility and a facility excluded or exempt from permitting, or solid waste facility that stores 500 or more waste tires must comply with standards for fire prevention, storage, disposal, transportation, and tire-derived products. It addresses the fire prevention measures that must be taken and submitted to the local fire authority. The regulation has established measures for waste tire outdoor and indoor storage, security, vector control, disposal, transportation, recordkeeping, and product handling. These measures ensure the safety and safekeeping of the tires, facilities, and environment.

3.1.3 Environmental Impacts

3.1.3.1 Impact Significance Criteria

The significance criteria used to evaluate the project's impacts related to solid waste are derived from the environmental checklist in Appendix G of the State CEQA Guidelines. According to Appendix G, a significant impact would occur if the project would:

(a) Require or result in the relocation or construction of new or expanded water, wastewater treatment, storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects.

(b) Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years.

(c) Result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments.

(d) Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals.

(e) Comply with federal, state, and local management and reduction statutes and regulations related to solid waste.

For reasons provided in Appendix A, *Initial Study*, the CEC staff concluded that most of the significance criteria listed above are not applicable to the proposed RTEP, primarily because the RTEP has no physical site location and, therefore, would not have a physical presence in the environment that could trigger impacts related to most of the listed criteria. As a result, there is no potential for impacts to occur related to those significance criteria. Therefore, the only significance criteria addressed in this section are **criterion (d)** and **criterion (e)**, which relate to the potential of the RTEP to generate solid waste in excess of standards or local infrastructure capacity, impair the attainment of solid waste goals, and comply with statutes and regulations related to solid waste.

3.1.3.2 Direct and Indirect Impacts

Generation of Solid Waste Exceeding State or Local Standards or the Capacity of Local Infrastructure, or Impairment of the Attainment of Solid Waste Reduction Goals

As discussed in Section 3.1.1.2, the annual waste tire tonnage managed by CalRecycle varies due to broader economic factors affecting the demand for recycled tire products and global tire markets, consumer preferences and behavior in tire purchasing decisions, geographic differences and regional driving needs, and technological advances that facilitate progress toward a circular economy for recycling waste tires.

The tire industry balances three performance parameters: wear resistance, fuel efficiency, and relative wet grip braking performance (traction). Regarding wear resistance and efficiency, CEC staff analyzed the relationship between tire efficiency and UTQG treadwear ratings (indicative of expected tire life) and found no inherent trade-off between tire efficiency and longevity that would reduce tire life under the proposed regulations (see Section 2.5.2, *Safety Considerations*). While data showed a general trend of longer-wearing tires having slightly lower efficiency, the correlation coefficient was small and therefore the test data does not show a causal relationship. Many tire

models demonstrated both low RRC and high UTQG treadwear grades, or both low RRC and high Treadwell mileage estimates, confirming that manufacturers can produce tires meeting both criteria (Blackburn et al. 2026, Chapter 7). Furthermore, testing conducted by Smithers showed that while OE tires are more efficient than replacement tires on average, there are already several replacement tire models on the market that match or exceed the average tire efficiency of OE tires without substantial cost increases (Sellers et al. 2024).

As demonstrated in CEC staff's analysis, significant and widespread tradeoffs are not present in current replacement tires. Furthermore, the USTMA provided comments to CEC regarding its initial staff report in which it stated that "member companies will not make a tire with an unacceptable wet traction level, we cannot predict how other tire manufacturers will respond to aggressive minimum performance standards for tire efficiency" (CEC 2023a, 14). The comment goes on to suggest a wet traction performance standard would "ensure continued tire safety as tire efficiency measures (are) adopted" (CEC 2023a, 14). Accordingly, the proposed regulations include a wet traction performance standard.

The CEC discussed the potential tradeoffs in wear, efficiency, and relative wet grip braking performance (traction) with tire manufacturers. These discussions identified that tradeoffs can exist at the extremes (e.g., tires designed for exceptionally high efficiency [low RRC], low wear, or high traction). CEC designed the proposed regulation to address each extreme. In the case of the efficiency extreme, the CEC reduced its overall efficiency proposal in both phases (higher RRC than originally proposed) and added more time for manufacturers to prepare for the regulation. In the cases of the traction and tire wear extremes, the CEC proposes less stringent rolling resistance requirements for tires that are significantly above average in those performances. Lastly, the proposal includes a relative wet grip braking performance index performance standard of 1.0. This standard will constrain traction tradeoffs while ensuring the RRC efficiency standards for replacement tires are met without sacrificing tread depth (which has the potential to affect wear). Together, these measures ensure energy-efficient and long-life tires remain available while maintaining adequate traction and wear performance. These stipulations help to ensure that the more efficient, low-rolling-resistant tire standards of the RTEP would not cause tires to wear out faster and generate more scrap tire waste.

When the regulation is implemented, retailers can continue selling their current stock of replacement tires manufactured prior to the implementation date. While there are no regulations around tire expiration dates, automakers and tire manufacturers recommend replacing tires around 6 years and 10 years, respectively. Thus, the CEC

staff have concluded that proposed regulation is not likely to cause an increase in stockpiling or discarding of replacement tires that do not meet the minimum efficiency and relative wet grip braking performance standards of the RTEP.

Additionally, PRC section 25773(d) requires the CEC (in consultation with the California Integrated Waste Management Board, now CalRecycle) to review the proposed regulation at least once every three years and make adjustments as needed. The CEC will track product compliance and trends in the tire market using manufacturer-reported data on the tire efficiency rating of each replacement tire sold under the regulation. PRC section 25773(a)(1)(D) states that the RTEP must not increase the amount of scrap tires generated within California, nor negatively impact state efforts to manage scrap tires pursuant to the California Tire Recycling Act. Since the proposed regulation will be reviewed and revised on a triennial basis, at a minimum, the CEC would assess the impacts of the RTEP and make amendments accordingly.

Compliance with Federal, State, and Local Management and Reduction Statutes and Regulations Related to Solid Waste

CalRecycle has informally adopted a 75 percent waste tire recycling goal, consistent with a statewide 75 percent recycling goal covering all waste materials mandated by AB 341 (Chesbro, Chapter 476, Statutes of 2011) (CalRecycle 2024, 22). Currently, about 35 percent of all waste tires managed by CalRecycle are recycled or converted to other uses.

As explained in more detail above, the CEC staff have concluded that the RTEP is not likely to increase the amount of waste tire tonnage, nor result in an expansion of an existing waste tire facility or construction of a new facility. The RTEP is designed to address any potential tradeoffs in wear resistance, fuel efficiency, and wet traction by including a relative wet grip braking performance standard, and relaxing the RRC MPS for ultra high-performance and long-life tires to maintain relative wet grip braking performance and wear resistance. This ensures energy-efficient and long-life tires remain available while maintaining adequate traction and wear performance. These stipulations mean that the more efficient, low-rolling resistant tire standards of the RTEP would not cause tires to wear faster or generate more scrap tire waste.

Conclusion

The CEC staff do not expect the RTEP to have any significant direct or indirect effects related to solid waste facilities because the regulations would not result in foreseeable impacts to the waste tire stream in California. Since the RTEP is not expected to increase the amount of waste tire tonnage, no expansion of an existing waste tire facility or construction of a new facility would be needed. For these same reasons, the RTEP is not expected to contribute to cumulative effects related to waste tire streams or facilities.

The RTEP also would not conflict or violate any existing federal, state, or local statutes and regulations related to solid waste. The regulation would be in compliance with the California Tire Recycling Act of 1990 and the stipulations of PRC sections 25770–25773 (see Section 3.1.2). Therefore, the CEC staff concluded that solid waste impacts would be less than significant.

3.1.3.3 Cumulative Impacts

The CEC staff do not expect the RTEP to make a considerable contribution to cumulative impacts related to solid waste streams or solid waste facilities. As discussed above, PRC sections 25770–25773 mandate that the RTEP must not increase the amount of scrap tires generated within California, nor negatively impact state efforts to manage scrap tires pursuant to the California Tire Recycling Act. Since the proposed regulation will be reviewed and revised on a triennial basis, the CEC would amend the RTEP if there were unintended impacts on the amount of waste tires being generated in the state to remain in compliance with PRC sections 25770–25773. Furthermore, retailers will be able to sell through their existing replacement tire stock after the regulation is implemented. Therefore, the CEC staff have concluded that the regulation is not likely to lead to an increase in stockpiling or landfilling of tires that don't meet the RTEP's standards. For these reasons, the RTEP would not make a considerable contribution to cumulative impacts.

3.2 Hazardous Materials

This section describes the project's environmental and regulatory setting and discusses potential impacts related to hazardous materials associated with adoption of the RTEP. Hazardous materials analysis focuses on potential impacts on the natural environment and human health as a result of exposure to these materials. A general description of the existing compounds that are used in the manufacturing of tires and the current regulatory environment, including legislative programs related to the manufacturing, storage, and disposal of tires.

3.2.1 Environmental Setting

Over the past two decades, the total world vehicles in use increased from 926.6 million in 2006 to 1.59 billion in 2020 (Statista 2025a; IOCA 2020). Overall, the United States recorded just under 282.4 million vehicle registrations. Automobiles and trucks are the leading categories in terms of motor vehicle sales in the United States, accounting for roughly 96 percent of all registrations. In 2021, California was the state with the highest number of motor vehicle registrations in the country. More than 31.3 million motor vehicles were registered in California, which is the nation's most populous state (Statista 2024). As a result, more than 51 million reusable and waste tires are generated each year (CalRecycle 2023). Furthermore, CalRecycle expects the yearly tonnage of waste tires in California to continue increasing as a result of projected growth in EVs, which

wear out tires faster than ICE vehicles due to weight and torque (see discussion in Section 3.1.1.2.). See below for a discussion on reusable and waste tires.

Primarily through the wearing down of tires used on roadways, tire rubber particles and their transformation products (TPs) are known to be released into the environment. The following discussion describes the tire manufacturing process and some of the chemical compounds that go into the production of tires and their derivatives.

The discussion of materials in tires in this section is not intended to be exhaustive as there are many different elements and compounds in tires and the actual chemical composition of tire rubber varies by tire type and by manufacturer. Rather, this section attempts to discuss hazardous substances of primary concern in tires.

3.2.1.1 Tire Manufacturing

The tire production process begins with the selection of several types of rubber along with oils, carbon black, antidegradants, silica, and other additives that will combine to provide the exact characteristics desired for a particular tire. Separate compounds are used for different parts of the tire (USTMA 2024b).

A machine called a Banbury mixer combines the various raw materials (see below for descriptions of the various materials used) into a homogenized batch of black or white material with the consistency of gum. The mixing process is both computer-controlled and operator-controlled to assure uniformity. The compounded materials are then sent to machines for further processing into the sidewalls, treads, and other parts of the tire.

The first component to go on the tire building machine is the innerliner, a special compound that helps reduce air and moisture permeation and takes the place of an inner tube. Next come the body plies and belts, which are often made from polyester and steel, respectively. Plies and belts give the tire strength while also providing flexibility.

Bronze-coated strands of steel wire, fashioned into two hoops, are implanted into the bead filler of the tires to form the bead. The tread and sidewalls are placed into position over the belt and body plies, and then all the parts are pressed firmly together. The end result is called a "green" or uncured tire.

The last step is to cure the tire. The "green" tire is placed inside a mold and inflated to press it against the mold, forming the tread and the tire identification information on the sidewall. Then it is heated at more than 300 degrees Fahrenheit for twelve to fifteen minutes,[40] vulcanizing it to bond the components and cure the rubber. Every tire is then inspected, and sample tires are randomly taken from the line and tested. Some are x-rayed, some are cut apart to look for flaws, others are run on test wheels, or road-tested to evaluate handling, mileage, and traction performance.

[40] Light-truck tires may take 20 minutes.

Total tire shipments in the United States reached approximately 335 million units in 2022, earning the tire manufacturing sector a gross output of approximately 25 million dollars (Statista 2025a, 2025b). The predominant category within these shipments was replacement passenger tires, accounting for roughly 222 million units (Statista 2025c). Although this sector is a significant segment of the nation's manufacturing and domestic production, none of these tires are produced in the state of California.

3.2.1.2 Tire Wear Particles

Tire wear particles (TWPs) are the material shed from tires from their use on the road. Approximately 100 million kilograms (kg) of TWPs are generated in the entire state of California, or about 2 to 3 kg per capita each year. These estimates are in the range of the U.S. Tire Manufacturers Association's estimate for California (2 kg per capita per year) (Moran et al. 2023).

TWPs are generated by mechanical friction between the road surface and a tire. TWPs can be found in either airborne or non-airborne form. A tire loses about 10 to 20 percent of its mass during its lifespan, and most TWPs (90.0 to 99.9 percent) are deposited on the road as non-airborne particulates. Where automobile and truck traffic are higher, production of particles may be significantly greater. Tire wear may be exacerbated by the heavier weight and increased acceleration and torque produced by electric vehicles (Mayer et al. 2024).

Measurable and sometimes significant amounts of tire particles have been collected in air, aquatic environments, and organisms. Non-airborne TWPs are released into the environment by runoff or wastewater treatment effluent while changing in morphology and chemical composition due to aging and weathering. Meanwhile, airborne TWPs can be transported on the road, soil, or surface water by dry and wet deposition. Road runoff is suggested as the main non-point source for receiving watercourses, while wastewater treatment plant effluents are point sources due to incomplete removal of target compounds after accepting the initial runoff. Further discussions of air quality and biological resource impacts associated with TWPs are included in Sections 3.3, *Air Quality*, and 3.4, *Biological Resources*, of this EIR.

TWPs have drawn attention as a source of particulate matter (PM) and microplastics (MPs), which have been a significant social and environmental concern because of their vast consumption, ubiquity in the environment, and toxic effects. Microplastics from TWPs are known to be a substantial contributor to the overall quantity of MPs in the oceans. Some studies even suggest that TWPs are the most abundant source of MPs exported into the sea. As tires contain a number of heavy metals, TWPs have been recognized as a major source of heavy metals being introduced into the environment. See Section 3.2.1.4 for further discussion of TWP microplastics.

The toxicity of TWPs stems from two different factors: the TWP itself and its leachate. Many studies have been performed on the adverse effects of microrubber and chemical leachate from TWPs. As a microrubber, TWPs have shown acute toxicity in freshwater

organisms as a result of TWP ingestion. The toxic influence of TWP leachate has also been demonstrated and the mortality of human alveolar lung cells and DNA damage has been observed when cells were exposed to TWP extract (Gualtieri et al. 2005).

3.2.1.3 Typical Tire Materials

As many as two hundred different raw materials are combined to produce a range of tires designed to provide ride comfort, performance, efficiency, reliability, and safety (USTMA 2024b). Tires are made of several materials, including natural rubber (NR), synthetic rubber (SR), steel, textiles (rayon, polyester, aramid, and nylon), fillers (carbon black, silica, clays, talc), chemicals, and fossil fuels as feedstock for producing many of the synthetic materials. Trucks and heavy-duty vehicles have more NR in their tires, while passengers or light-duty vehicles have more SR. Due to the cost of transporting and variability of pricing NR, SR use is high, making up around 60 percent of tire rubber, while NR makes up about 40 percent (Contec 2024).

A wide variety of natural or synthetic elastomers, fillers (e.g., carbon black, precipitated silica or silicates, clays, talcs) and additives are used in compounding to create the necessary properties of the final rubber product. The actual chemicals used in this process have changed over time and vary extensively depending on the manufacturing sector (e.g., tires, general rubber goods, re-treading), and on the specific manufacturing plant.

Compounding ingredients in tires can be classified as follows:

- Vulcanizing agents (e.g., elemental sulfur, sulfur donors such as organic disulphides and higher sulphides);
- Vulcanization accelerators (e.g., sulphenamides, thiazoles, guanidines, thiurams, dithiocarbamates, dithiophosphates, and miscellaneous accelerators such as zinc);
- Vulcanization activators (e.g., zinc oxide, magnesium oxide);
- Retarders and inhibitors of vulcanization (e.g., benzoic acid, salicylic acid, phthalic anhydride, N-(cyclohexylthio) phthalimide);
- Dynamic antiozonants (e.g., phenyl-p-phenylenediamine [6PPD, 77PD, DAPD]);
- Antioxidants (e.g., phenolics, phosphites, thioesters, amines, bound antioxidants such as quinone-diimines, miscellaneous antioxidants);
- Static antiozonants (waxes);
- Anti-reversion agents (e.g., zinc carboxylates, thiophosphoryl derivatives, silane coupling agents, sulphenimide accelerator, hexamethylene-1,6-bis thiosulphate disodium dehydrate, and 1,3-bis[citranimidomethyl]benzene);

- Plasticizers and softeners (e.g., petroleum products such as petroleum waxes and mineral oils, coal-tar products such as coumarone resin, pine products, synthetic softeners, and other products such as vegetable oils and fats); and
- Miscellaneous ingredients (such as peptising agents, bonding agents, and pigments) (NIH 2012).

There are thousands of chemicals that may be found in tire material, of which several are considered more harmful than others when exposed to ecological resources through the generation of TWPs.

Some of the chemicals are deliberately added, such as N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine (6PPD). 6PPD is not harmful, but a transformative product of 6PPD known as 6PPD-quinone (6PPD-Q) may be harmful to certain ecological environments (Mayer et al. 2024). Europe has required a reduction of polycyclic aromatic hydrocarbons (PAHs), which are byproducts of manufacturing feedstocks in tire compounds. This is not a concern in terms of tire manufacturing, but rather in weathering or TPs as tires age. As a result, there is no standard chemical composition of TWPs. This creates many challenges for monitoring and characterizing tire particles and tire-derived chemicals in environmental samples and for conducting ecotoxicology impact assessments (Mayer et al. 2024).

Natural Rubber

NR is a polymer consisting of isoprene units linked together. Although rubber is produced in over 2,500 plant species, commercial rubber is currently almost exclusively harvested from one biological source, the Brazilian Para rubber tree (*Hevea brasiliensis*). Nearly 90 percent of all rubber is harvested in Southeast Asia, and the major producer countries include Indonesia, Thailand, and Malaysia. Rubber is used at about 1.5 times more than the production of SR, despite its labor-intensive production, by manually tapping the latex from the rubber trees. This occurs because of the superior properties of NR: efficient heat dispersion, superior resilience, elasticity, impact resistance, and flexibility at cold temperatures, properties that are a function of its polymeric macrostructure, high molecular weight, and additional, although rather ill-defined, components present in the latex, such as proteins, lipids, carbohydrates, and minerals (Cataldo 2000, Cornish 2001). Thus, NR is almost irreplaceable in many applications, such as heavy-duty tires for trucks, buses, and airplanes, as well as in latex products for medical applications (Cornish 2001). SRs (e.g., styrene-butadiene or acrylonitrile-butadiene copolymers) are also produced at a scale of several million tons per year (Beilen and Pourier 2012).

Synthetic Rubber

SR in tires is traditionally considered to be any petrochemical-based elastomer. The terms rubber and elastomer are used interchangeably, generally referring to a material that, following vulcanization, can be stretched to at least twice its original length after

release of the force applied in the stretching. Like NR, SRs are polymers, consisting of a series of simple molecules, called monomers, linked together to form large chain-like molecules. The chain forms a loose coil that returns to its coiled form after it is extended. Types of SRs include butyl rubber, ethylene-propylene rubber, neoprene rubber, nitrile rubber, polybutadiene rubber, polyisoprene rubber, and styrene-butadiene rubber. The properties of SRs can be greatly enhanced by the incorporation of additives like carbon black and vulcanizers, as is the case with tire production (Cheremisinoff 2001).

Fillers

Carbon Black

Carbon Black is virtually pure elemental carbon in the form of colloidal particles that are yielded by incomplete combustion or thermal decomposition of gaseous or liquid hydrocarbons in a controlled environment. It appears as a black, finely divided pellet or powder and can be found in many industrial products such as tires and rubber products as a filler or reinforcing agent (approximately 90 percent of carbon black is used in rubber applications), plastic products, printing inks and coatings. At 18 billion pounds per year, carbon black is in the top 50 industrial chemicals manufactured worldwide. Carbon black's use is related to properties of specific surface area, particle size and structure, conductivity and color (ICBA 2024).

Currently, it is estimated that over 90 percent of carbon black is produced from non-renewable fossil fuels, such as coal tar, aromatic oil, natural gas, and acetylene. Characteristics of carbon black, including particle diameter, paracrystalline size, structure, surface purity and purity, are factors that affect its application performance. Recently, carbon black has been a topic of discussion in the waste tire industry as many studies suggest extracting carbon black through pyrolysis from the over 17 million tons of waste tires annually could be a viable solution for recycling this abundant waste product. Pyrolysis is a clean and low-carbon thermochemical technology for waste tire management that converts waste tires to high-value alternative fuels (gas and liquid oil), carbon black, limonene, and monocyclic aromatic hydrocarbons (Jiang et al. 2024).

Silica

Silica is a common mineral formed from the bonding of the Earth's two most abundant elements, oxygen and silicon, and makes up approximately 60 percent of the Earth's crust. This makes the mineral a key component in industrial products. It is present in many materials extracted from the ground and is an essential component of numerous products of our daily lives, including ceramics, glass, paints, plastics, aids in industrial processes, and in many construction products like cement and plaster (Pavan et al. 2019). Silica has characteristic properties such as hydrophilicity (water-affinity) and thermal stability.

In the tire industry, hydrated amorphous silicas are typically used because they are metastable with water-saturated amorphous phases that can retain a constant amount of water for extended periods (Neethirajan et al. 2022). A prominent change in the recent past was the use of a silica-silane filler system in many passenger car tread compounds, accompanied by lower loadings of carbon black, instead of traditionally used all-carbon black (Hoek et al. 2019).

Antioxidants

Antioxidants are indispensable additives in the rubber industry as they enhance the reliability and service life of the rubber product by protecting it from degradation. Rubbers are particularly susceptible to aging, leading to the deterioration of the outlook, hardness, and physical/mechanical performances as they become sticky, hard, brittle or cracked after long-term use or storage.

Antioxidants can be classified according to their antiaging mechanisms (countering oxidative degradation), effects on appearance (discoloration vs. non-discoloration, and contamination vs. non-contamination), specific function (heat resistance, bending, and crack resistance), and physicochemical properties (natural, physical, and chemical antioxidants). Natural antioxidants are only found in NR, such as amino acids, tocotrienol, and betaines, whereas physical and chemical antioxidants are widely used in various SR products.

Chemical antioxidants are generally classified as amine, phenolic, heterocyclic, phosphite, as well as nickel salt[41] antioxidants according to their chemical structure. Tires are typically composed of a mixture of several types of anti-aging additives, including all four antioxidant classifications (Castan et al. 2023).

- **Amine Antioxidants.** Amine antioxidants[42] are the most common rubber antioxidants and are widely used in the rubber industry.
- **Phenolic Antioxidants.** Phenolic antioxidants[43] can be divided into alkylene phenolic, substituted monobasic phenolic, polybasic phenolic, and sulfurized disubstituted phenolic antioxidants. Among them, benzothiazole (BTH) has a good performance to protect rubber from aging caused by heat, oxygen, and metals.

[41] nickel dibutyl dithiocarbamate (NBC).

[42] Typical amine antioxidants include diaryl-secondary amine, acetone-amine condensation product, p-phenylenediamine, and aldehyde-amine condensation product antioxidants. The most common products include 6PPD, N,N′-bis(1,4-dimethylpentyl)-p-phenylenediamine (77PD), tris-(N-dimethylpentyl-p-phenylenediamine)-N,N′,N″-1,3,5-triazine (PPDTZ), 1,3,5-Triazine-2,4,6-triamine, N,N′,N″-tris [4-[(1,4-dimethylpentyl)amino]phenyl] (TMPPD), N-isopropyl-N′-phenylenediamine (IPPD), and the 2,2,4-Trimethyl-1,2-dihydroquinoline (TMQ).

[43] Typical phenolic antioxidant products include 2,2′-methylenebis (6-tert-butyl-4-methyl-phenol), 2,6-di-tert-butyl-4-methylphenol (BHT), and styrenated phenol (SP).

- **Heterocyclic Antioxidants.** Heterocyclic antioxidants[44] are mainly used to prevent thermal and oxygen aging. Among the commercial products of heterocyclic antioxidants, 2-mercaptobenzimidazole (MB) and 2-mercaptobenzimidazole zinc salt (MBZ) are the two most common products (Xu et al. 2022). See below discussion on benzothiazole and its derivatives.
- **Phosphite Antioxidants.** Phosphite, as a hydroperoxide-decomposing agent and a free-radical-trapping agent, plays a key role as an auxiliary antioxidant in polymer systems. Phosphite antioxidants mainly include tris(nonylphenyl) phosphate (TNP), tris(1,2,2,6,6-pentamethylpiperidinyl) phosphite (GW-540), and tris(2,4-di-tert-butylphenyl) phosphite (Irgafos168). GW-540 is widely used in tires blended with styrene-butadiene rubber and polybutadiene rubber. TNP is suitable for NR, SR, latex, and plastic products and provides considerable heat resistance when used as a rubber stabilizer.

Unfortunately, antioxidative efficiency, toxicity, and blooming/migration issues have plagued the development of rubber antioxidants (Zhao et al. 2023). Antioxidants may be transformed in the environment (transformation products) due to oxidative degradation, producing novel compounds that are currently being observed for their toxicity characteristics.

Benzothiazole (BTH) and Associated Derivatives

Benzothiazole and its derivatives (BTs) are high production volume chemicals that have been used for several decades in a large number of industrial and consumer products, including vulcanization accelerators of rubber products. Several benzothiazole derivatives are used commercially, and widespread use of these chemicals has led to ubiquitous occurrence in diverse environmental compartments. BTs have been reported to be dermal sensitizers, respiratory tract irritants, endocrine disruptors, carcinogens, and genotoxicants. The use of BTs in a number of consumer products, especially in rubber products, has resulted in widespread human exposure. BTs undergo chemical, biological, and photolytic degradation in the environment, creating several TPs. Several compounds of the BT group have been pointed out as persistent, mobile, and toxic (PMT) substances, including BT, 2-mercaptobenzothiazole (MBT), 2-(morpholinothio) benzothiazole, and 2-SCNMeS-BTH.[45] This indicates that these PMT substances may potentially experience long-range transport over long time scales once TWP is released into the environment. Due to the technically tricky removal of BT, Domínguez et al. (2012) measured similar BT concentrations in the influent and effluent of a wastewater treatment plant. The distribution and transformation of benzothiazole and its derivatives in various environmental matrices are difficult to estimate and therefore the occurrence of other derivatives of BT has not been fully considered.

[44] Heterocyclic antioxidants mainly include 2-mercaptobenzimidazole (MB), 2-mercaptomethylbenzimidazole (MMB), 2-mercaptobenzimidazole zinc salt (MBZ), 2-mercaptomethylbenzimidazole zinc salt (MMBZ) and the benzothiazole derivatives.

[45] 2-thiocyanomethylthio-benzothiazole

Among the various chemical leachates from TWPs, BT and heavy metals are commonly considered key drivers of toxicity. TWPs are among the major sources of BT and heavy metals introduced into the environment. BT and its derivatives are recalcitrant to biodegradation in general, which has led to their frequent detection in the environmental matrix (Jeong et al. 2022).

6PPD

6PPD (N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine) is a globally ubiquitous tire rubber diphenylamine antioxidant derivative. Antioxidants such as PPDs, dihydroquinoline, and phenolics are designed to diffuse to tire rubber surfaces. By reacting with ground-level atmospheric ozones and other reactive oxidants, a protective film is formed to prevent ozone-mediated oxidation of rubber elastomers. The compound 6PPD-Q is an oxidation product 6PPD that is intended to prevent damage to tire rubber. This antiozonant application of 6PPD increases roadway runoff toxicity and environmental risk by forming the more toxic and mobile 6PPD-Q TP that is then transported into the environment (Tian et al. 2020).

During a rain event, stormwater from hard surfaces such as parking lots and streets washes tire wear particles into streams and other bodies of water, leading to potential exposure to aquatic organisms. Available information on 6PPD-Q indicates that it is toxic enough to quickly kill some fish. A 2021 publication in the journal Science linked coho salmon death to 6PPD-Q in stormwater. Concentrations in stormwater were found to be lethal for coho salmon following exposures lasting only a few hours. Subsequent work identified some other fish species as vulnerable to 6PPD-quinone (USEPA 2024a). 6PPD-Q's toxicity to fish is further discussed in Section 3.4, *Biological Resources*. The California Department of Toxic Substances Control (DTSC) has finalized a regulation pursuant to the Safer Consumer Products (SCP) Regulations to list motor vehicle tires containing 6PPD as a new Priority Product (see Section 3.2.2, *Safer Consumer Products*, for a description of Priority Products) effective October 1, 2023 (DTSC 2024a).

Processing Additives

Polycyclic aromatic hydrocarbons (PAHs)

Polycyclic aromatic hydrocarbons (PAHs) are a class of over a hundred different compounds often consisting of three or more fused benzene rings containing only carbon and hydrogen produced by incomplete combustion or high-pressure processes (ATSDR 2023). The entire class of PAHs is included on DTSC's Candidate Chemicals List as it is known to be a carcinogenic, mutagenic, and reproductive (CMR) toxicant that is persistent, bioaccumulative, and toxic (PBT), and very persistent and very bioaccumulative. Although occurring naturally as complex mixtures in fossil fuels, or during the incomplete combustion of fossil fuels, wood, garbage, and other organic matters, they can also be manufactured as single compounds. PAHs are found in the extender oils, plasticizer oils, vulcanizing compounds, and carbon black used to make tires (Hoyer et al. 2022).

PAHs are found ubiquitously in California, in part due to their transport through TWP and its leachate. PAHs can be found in stormwater runoff, sediments, and surface water. Although structurally diverse, PAHs share similar chemical properties and mechanisms of toxicity; they are often represented by benzo[a]pyrene, a well-studied PAH that is among the class members found in tires. Due to European legislation, PAHs have been reduced in tire compounds for tires sold in the European Union where benzo[a]pyrene chemicals must be tested and reduced in polymers, carbon black, and free oil that are compounded in tread compounds.

Per- and Polyfluoroalkyl Substances (PFAS)

Per- and polyfluoroalkyl substances (PFAS) are ubiquitous in environmental media because of their prolific use in a variety of industrial and consumer products and processes and longevity. Widespread human exposure to PFAS in water, food, and air coupled with a lengthy environmental persistence and biological half-lives of some PFAS, have led to measurable PFAS in the blood of nearly the entire population in developed countries, with health effects reported globally. The United States Environmental Protection Agency (USEPA) has a curated list of over 8,000 PFAS, based on structure from the CompTox Chemicals Dashboard. The USEPA estimates that more than 600 PFAS are currently in commercial use, including in the production of rubber (Glüge et al. 2020). Experimental studies of PFAS have been limited by funding and the availability of analytical standards, confounded by the prevalence of background contamination in laboratory materials, and challenged by physicochemical properties such as high surface activity that can interfere with and complicate measurements. Consequently, sufficient information to conduct quantitative risk assessment is currently available for only a relative few PFAS. There are numerous health effects reported for those PFAS tested, which sets this family of chemicals apart from many others and elevates the need for precautionary action.

The USEPA is leading the national effort to understand PFAS and reduce PFAS risks to the public. PFAS are found in a wide array of consumer and industrial products. PFAS manufacturing and processing facilities, facilities using PFAS in production of other products, airports, and military installations are some of the potential contributors of PFAS releases into the air, soil, and water. Due to their widespread use and persistence in the environment, most people in the United States have been exposed to PFAS (USEPA 2024b).

The California Health and Safety Code (HSC), specifically HSC section 108981 states, "Perfluoroalkyl and polyfluoroalkyl substances, a class of chemicals known as "PFAS," are highly toxic and highly persistent in the environment," and "PFAS have been linked by scientific, peer-reviewed research to severe health problems, including breast and other cancers, hormone disruption, kidney and liver damage, thyroid disease, developmental harm, and immune system disruption, including interference with vaccines." Furthermore, the HSC notes that the federal Centers for Disease Control and Prevention's National Health and Nutrition Examination Survey found PFAS in the blood

of 97 percent of Americans, suggesting virtually ubiquitous exposure of Californians to these highly toxic chemicals.

Chlorinated Paraffins

Chlorinated paraffins (CPs) are a group of hydrocarbons of various chain lengths in which multiple hydrogen atoms are substituted with chlorine atoms; they can be divided into short-, medium-, and long-chained congeners and are included as a class in DTSC's Candidate Chemicals List. Short-chained CPs are no longer produced in the United States and have presumably been replaced with medium- and long-changed CPs. Uses of CPs include tire manufacturing and repair, plasticizers, lubricants, flame retardants, and rubber additives. CPs have been found within TWP and tire crumb and as a result, CPs have been detected globally throughout various environmental conditions. Because CPs are considered to be persistent and bioaccumulate, they have been found in remote areas of the environment. Furthermore, as the length of a CP's chain and chlorine content increases, the greater the likelihood of bioaccumulation and persistence of the CP. Individual CPs, some of which have also been identified in tire manufacturing, have been shown to be toxic to aquatic species such as invertebrates (DTSC 2021).

Vulcanizing Additives

Vulcanization is a critical process in the rubber industry that enhances the mechanical properties and durability of rubber materials. It is widely used to transform raw NR or other polymer materials, such as SR, into more robust and versatile products. The process involves the cross-linking of rubber sites using various vulcanizing additives. During vulcanization, the rubber is typically mixed with sulfur and other additives, such as accelerators and activators (Amna et al. 2024). As the chemical formulas used in the manufacturing of tires are not publicly available for proprietary reasons, it is difficult to point to the specific source of each of these chemicals.

Diphenylguanidine (DPG) and Derivatives

1,3-diphenylguanidine (DPG) is a bicyclic amine that is frequently used in rubber production as a vulcanization accelerator that has been previously detected in surface waters impacted by TWP. DPG is used mainly in silica-filled tread compounds as an essential ingredient, mainly as a secondary accelerator for the sulfur vulcanization reaction. DPG is not as common in carbon-black-filled tread compounds. Many structurally similar compounds to DPG have been identified as TWP leachate and/or have co-occurred with DPG in runoff and surface waters. These include 1,3-dicyclohexylurea, N-methyl-dicyclohexylamine, 1-cyclohexyl-3-phenylurea, and phenylguanidine, which is likely a TP of DPG. DPG has also been found to react rapidly with chlorine and bromine during waste treatment processes, forming a variety of TPs. The majority of the currently identified transformation compounds and derivatives of DPG have unknown properties and environmental fate, prompting the need for further investigation (Johannessen et al. 2021b).

Although DPG is not currently on the DTSC's Candidate Chemicals List, it is a registered substance under the USEPA's ECOTOX Knowledgebase and the European Chemicals Agency REACH regulation, and classified as toxic to aquatic organisms with a potential to cause long-term adverse aquatic environmental effects (DTSC 2021, USEPA 2024b).

Hexamethoxymethylmelamine

Hexamethoxymethylmelamine (HMMM) is a crosslinking agent that is widely used in the production of coatings and plastics, as well as in the manufacturing of tires. It is produced via the reaction of melamine with formaldehyde and excess methanol, with the latter also acting as a solvent for the reaction (USEPA 2024c). Due to its widespread use, HMMM was included as a compound of interest in the "High Production Volume Challenge Program" established by the USEPA. Elevated levels of HMMM in road runoff (stormwater) have been linked with mortality of coho salmon and were reported at elevated concentrations during mortality events of *Daphnia magna*[46] in the Netherlands (Rauert et al. 2020). It appears that HMMM, while falling under the exemptions of REACH registration, is a precursor for widely found persistent and mobile TPs that can reach waters used for drinking water.

HMMM is highly water soluble and concentrations in river waters were noted to be highly variable and suggested to indicate (indirect) industrial discharge and in roadway runoff from TWP. Additionally, some of its TPs like TMMM[47] and HMPE[48] have been reported to occur in road runoff, some of which are persistent and mobile enough to make their way from municipal wastewater via surface waters to bank filtrate use as raw water for drinking water production (Alhelou et al. 2019).

Heavy Metals

Zinc

Zinc is a naturally occurring metal that is brittle and crystalline at room temperature, but becomes malleable when heated to temperatures between 230°F (110°C) and 302°F (150°C). It is a fairly reactive metal that will combine with oxygen and other non-metals and will react with dilute acids to release hydrogen. Zinc is used primarily for galvanizing iron but is also important in the preparation of certain alloys. Zinc is the primary metal used in making American pennies, is used in die casting in the automobile industry, and as an activator in the rubber industry (zinc oxides). In rubber production, its role is to act as a catalyst during manufacturing and as a heat disperser in the final product (Lenntech 2024).

As a trace element, zinc is essential for human health. When people absorb too little zinc they can experience a loss of appetite, decreased sense of taste and smell, slow wound healing and skin sores. Zinc shortages can even cause birth defects. However,

[46] A small planktonic crustacean (adult length 1.5–5.0 mm) that belongs to the subclass Phyllopoda.

[47] tetra(methoxymethyl)melamine

[48] hexamethylolmelamine pentamethyl ether

too much zinc can still cause eminent health problems, such as stomach cramps, skin irritations, vomiting, nausea and anemia. Very high levels of zinc can damage the pancreas and disturb the protein metabolism and cause arteriosclerosis. Extensive exposure to zinc chloride can cause respiratory disorders.

Zinc can also be problematic when released into the environment. Through the release of TWP and associated leachate, the amount of zinc in the environment has become a growing concern. Although, the underlying growth inhibition mechanism of plants by TWPs remains unclear, some literature has attributed it to zinc and its compounds in the leachate (Wang et al. 2024). TWPs are a significant source of zinc in the aquatic environment, and aquatic organisms in California's streams, rivers, and lakes may be adversely impacted by exposure to zinc. Because of this, the USEPA and the State Water Resources Control Board (SWRCB) have developed water quality criteria that describe the point at which the amount of zinc in a water system becomes hazardous to aquatic organisms. In California, municipal agencies are responsible for adhering to zinc permit requirements for stormwater discharges. Many of these agencies face challenges staying in compliance with permits due to high levels of zinc in their stormwater. Stormwater treatment can reduce zinc concentrations but is often prohibitively expensive. For this reason, the DTSC proposes to list motor vehicle tires that contain zinc as a Priority Product under the Safer Consumer Products Regulations (DTSC 2024b).

3.2.1.4 Microplastics

Globally, tires may be one of the top sources of microplastics to the environment, with a pollutant mass exceeding the total environmental emissions of other pollutant classes like pharmaceuticals and pesticides (Mayer et al. 2024).

Microplastics are defined as solid, water-insoluble, polymer-based particles smaller than 5 mm with a low degradation rate. Microplastic particles are recognized as a global threat because of their ubiquitous distribution in water bodies all around the world, and their potential health impacts on animals, including humans, due to the many potential exposure pathways and risks. Microplastics comprise a wide range of materials, without a standardized definition, but in the wider scope including particles of conventional thermoplastics (i.e., from common household plastics), polymer composites, rubbers, and elastomers, and synthetic fibers. Material flow modeling has indicated that the three main microplastic sources are tire and road wear particles, fibers and paint, with some estimates suggesting the tire emissions represent 5 to 10 percent of the world's microplastics that eventually migrate to the oceanic environments (Mattsson et al. 2023).

The estimated per capita emissions of microplastics ranges from 0.23 to 4.7 kg/year, with a global average of 0.81 kg/year. The emissions from car tires are substantially higher than those of other sources of microplastics (Kole et al. 2017).

3.2.2 Regulatory Setting

Various existing federal and state regulations help reduce or avoid environmental impacts related to hazardous substances. Relevant regulations include:

- **The Toxic Substances Control Act (TSCA) of 1976.** The TSCA provides the USEPA with authority to regulate and screen all chemicals produced or imported into the United States, including requirements and restrictions to prevent unreasonable risks to health and the environment (USEPA 2024d). The TSCA provides authority to require: pre-manufacture notification for "new chemical substances"; testing of chemicals by manufacturers, importers, and processors where risks or exposures of concern are found; issuance of a Significant New Use Rules, when an identified "significant new use" that could result in exposures to, or releases of, a substance of concern occurs; maintenance of the TSCA Inventory; certification for importing and exporting chemicals; reporting and record-keeping by persons who manufacture, import, process and/or distribute chemical substances in commerce; and that any person who manufactures (including imports), processes, or distributes in commerce a chemical substance or mixture and who obtains information which reasonably supports the conclusion that such substance or mixture presents a substantial risk of injury to health or the environment to immediately inform USEPA.
- **National Pollutant Discharge Elimination System (NPDES).** The NPDES program regulates wastewater stormwater discharges to surface waters in the state of California, pursuant to the federal Clean Water Act and California's Porter-Cologne Water Quality Control Act. Although some wastewater discharges are exempt from federal requirements, the state may impose regulations such as the regulation of discharges to land that could potentially affect groundwater through waste discharge requirements. The Municipal Stormwater Program regulates stormwater discharges from municipal separate storm sewer systems, a conveyance system designed to collect and convey stormwater that is owned by a city, town, or other public entity. NPDES permits contain specific requirements that limit the pollutants in discharges and require monitoring to ensure that the discharges meet those requirements.
- **California's Green Chemistry Initiative.** In 2008, the California Legislature authorized two laws with the intent of protecting Californians from toxic chemicals in products, and to inform the general public about chemical hazards and their potential effects on the environment and human health. Under Assembly Bill 1879, the Safer Consumer Products Program requires the DTSC to evaluate Chemicals of Concern in products and their potential alternatives, and to reduce hazards associated with chemicals found in consumer products. Senate Bill 509 established a Toxics Information Clearinghouse (TIC) for data on chemical hazards (OEHHA 2024a). The Office of Environmental Health Hazard Assessment (OEHHA) was required to identify the hazard traits to be included in the TIC (Solomon et al. 2018).

- **Safer Consumer Products.** The Safer Consumer Products (SCP) Regulations, enacted under California's Green Chemistry Initiative and managed by the DTSC, establish a science-based process to identify specific products that contain potentially harmful chemicals and to evaluate potential safer alternatives. These regulations aim at advancing the design, development, and use of products that are chemically safer to human health and the environment by maintaining an informational list of Candidate Chemicals which contain properties of concern. Implementation of the SCP regulations requires the DTSC to publish an triannual Priority Product Work Plan that provides a list of product categories planned for evaluation during those three years; identify potentially hazardous product-chemical combinations, known as Priority Products, that may expose individuals or the environment to one or more Candidate Chemicals (Priority Products are listed in the CCR through legislative action); require manufacturers of Priority Products sold in the state to notify the DTSC and conduct an Alternatives Analysis, or take action to remove their product from the market or remove or substitute the Chemical of Concern; issue Regulatory Responses based on Alternative Analyses; ensure compliance with and the SCP and take enforcement actions as needed; and to maintain the CalSAFER informational database. CalSAFER provides a conduit for stakeholders to submit public comments and documentation to show compliance with SCP Regulations (DTSC 2024c).
- **California Hazardous Waste Control Law.** The California Hazardous Waste Control Law (HWCL) is administered by the California Environmental Protection Agency (CalEPA) to regulate hazardous wastes. The HWCL lists 791 chemicals and about 300 common materials that may be hazardous; establishes criteria for identifying, packaging and labeling hazardous wastes; prescribes management controls; establishes permit requirements for treatment, storage, disposal and transportation; and identifies some wastes that cannot be disposed of in landfills.
- **Safe Drinking Water and Toxic Enforcement Act (Proposition 65).** Proposition 65, officially known as the Safe Drinking Water and Toxic Enforcement Act of 1986, was enacted as a ballot initiative in November 1986. The proposition protects the state's drinking water sources from being contaminated with chemicals known to cause cancer, birth defects or other reproductive harm, and requires businesses to inform Californians about exposures to such chemicals. The list contains a wide range of naturally occurring and synthetic chemicals that include additives or ingredients in pesticides, common household products, food, drugs, dyes, or solvents. Listed chemicals may also be used in manufacturing and construction, or they may be byproducts of chemical processes, such as motor vehicle exhaust. Proposition 65 also prohibits state businesses from knowingly discharging significant amounts of listed chemicals into sources of drinking water (OEHHA 2024b).
- **California Health and Safety Code.** The California Health and Safety Code (HSC) is a set of statutory laws that cover health and safety in California. It was

signed into law in 1939. The California HSC, primarily Division 20, Chapters 6.5 through 10.6, and Title 22, Division 4.5, covers hazardous materials and toxic substances. Enactments of the code, including Proposition 65, specifically sections 25249.5 through 25249.14, include mandates such as the state maintaining a list of chemicals known to cause cancer or reproductive harm and requires businesses to notify Californians about exposure to these chemicals through clear warnings when significant amounts are present in products or released into the environment.

3.2.3 Environmental Impacts

3.2.3.1 Impact Significance Criteria

The significance criteria used to evaluate the project's impacts related to hazardous materials are derived from the environmental checklist in Appendix G of the State CEQA Guidelines. According to Appendix G of the State CEQA Guidelines, a significant impact would occur if the project would:

(a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials.

(b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment.

(c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school.

(d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment.

(e) Would the project result in a safety hazard or excessive noise for people residing or working in the project area. (For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport.)

(f) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan.

(g) Expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires.

For reasons provided in Appendix A, *Initial Study*, the CEC staff concluded that most of the significance criteria listed above are not applicable to the proposed RTEP, primarily because the RTEP has no physical site location and, therefore, would not have a physical presence in the environment that could trigger impacts related to most of the

listed criteria. As a result, there is no potential for impacts to occur related to those significance criteria. Therefore, the only significance criterion addressed in this section is **criterion (a)**, which relates to the potential of the RTEP to cause a hazard to the public or the environment through the routine transport, use, or disposal of replacement tires, specifically energy-efficient replacement tires that would be mandated by the RTEP regulations, if approved. As described in Section 3.2.1 above, tires contain substances that are either known or suspected to be hazardous to people and/or the environment.

3.2.3.2 Direct and Indirect Impacts

Hazards to the Public or the Environment Through the Routine Transport, Use, or Disposal of Hazardous Materials

As described above in Section 3.2.1, *Environmental Setting*, tires contain multiple substances that are considered hazardous. This is part of the baseline condition and is not expected to change with the implementation of the RTEP regulations as the regulations do not propose the removal, substitution, or change in quantity of any of the hazardous substances found in tire rubber. The specific constituents of tire rubber vary by tire and manufacturer and are considered proprietary formulations intended to provide desired performance characteristics for various types of tires, depending on the type of tire and the target market for the tire. Individual tire manufacturers may choose to modify the formulation of tire rubber to reduce rolling resistance in response to the RTEP regulations, although there are also other strategies or combinations of strategies available to achieve this objective, including changes in tread design, tire construction, and tire dimensions. However, specific changes that may be made to tire rubber formulations to reduce rolling resistance are unknown at this time and cannot be accurately predicted. If changes are made, they will undoubtedly vary by manufacturer and by tire type, similar to the current situation.

As discussed in Section 3.2.1.3, *Tire Wear Particles*, the routine use of tires on roadways results in the shedding of tire-rubber particles from the tires. TWP are generated from both OE tires and replacement tires. TWP is an existing environmental concern that is part of current baseline conditions in California and everywhere else in the world where vehicles with tires are routinely operated. Similarly, hazardous substances in tire rubber are already being introduced into the environment via TWP, although the specific environmental harm that may be caused by some of these substances is not currently well understood, including their persistence, mobility, and transformation in the environment. However, some of the substances found in TWP are known to be hazardous, and even toxic, with potential adverse health effects on people and wildlife, as discussed in Section 3.2.1, *Environmental Setting*, above, and Section 3.4, *Biological Resources*.

There could be a project-induced increase in the release of TWP into the environment if the RTEP caused replacement tires to shed TWP more readily than under current

conditions. Current conditions represent the sale and use of tires in California that are not required to meet any state-mandated standards for energy efficiency. However, the CEC has crafted the proposed RTEP regulations to avoid resulting in a situation in which RTEP-compliant replacement tires shed TWP more readily (wear at faster rate), on average, than replacement tires currently available to California consumers. This will be achieved primarily through the application of RRC minimum performance standards for different categories of replacement tires, along with a relative wet grip braking performance index performance standard of 1.0 (described in Section 2.4, *Project Characteristics*). These standards will constrain traction tradeoffs while ensuring the RRC efficiency standards for replacement tires are met without sacrificing tread depth (which has the potential to affect wear). Thus, the proposed minimum performance standards of the RTEP will balance efficiency, tread life, and relative wet grip braking performance (traction) to ensure that replacement tires can continue to be long lasting, while also being more energy efficient.

Because the RTEP regulations are not expected to cause replacement tires to shed rubber at a faster rate, on average, than existing replacement tires, the RTEP would not contribute to an increase in the generation of TWP. Therefore, the RTEP would also not contribute to any increase in the release of chemicals contained in TWP that may be harmful to the environment.

As discussed above, it is possible that tire manufacturers will develop modified rubber compounds that help reduce the rolling resistance of replacement tires; however, the exact nature of such changes cannot be accurately predicted and will undoubtedly vary among manufacturers. While there are various elements and chemical compounds of concern in tire rubber, the CEC staff do not believe that it is reasonable to expect the RTEP to cause an increase in the use of additives that do not improve the rolling resistance of tire rubber. This includes the use of antiozonants (e.g., 6PPD) and antioxidants as they do not improve the rolling resistance of tires but rather are added to tire rubber to prevent degradation. One particular chemical of current concern found in tire rubber, as previously discussed, is 6PPD, which is used to improve the durability of tires. The amount of 6PPD used in tire rubber is not expected to change as a result of the RTEP regulations because its use does not affect the rolling resistance of tires. Therefore, tire manufacturers would have no reason to change the amount of 6PPD in tires to conform to the RTEP regulations. Similarly, there is no foreseeable reason that manufacturers would change the amounts of antioxidants like BHT and BTs in tire rubber. It is not known whether the use of various other vulcanizing and processing additives might be changed in some tire rubber formulations, although any such changes are unlikely to be substantial as additives make up a relatively small part of the chemical composition of tire rubber. Fillers, like carbon black and silica, are more likely candidates for modification in tire rubber formulation because fillers play a more

significant role in the physical structure of tire rubber (such as increasing stiffness) and may help reduce rolling resistance.

Over time and unrelated to the RTEP, it is possible that fewer hazardous substances will be used in tires. For example, DTSC has finalized a regulation pursuant to the Safer Consumer Products Regulations to list motor vehicle tires containing 6PPD as a new Priority Product effective October 1, 2023. Additionally, DTSC initiated rulemaking on July 11, 2025, to add para-phenylenediamine (PPD) derivatives, which include 6PPD, to its Candidate Chemicals list. These actions may eventually lead to the elimination of 6PPD in tires sold in California, assuming that a safer alternative to 6PPD is identified. Similarly, DTSC proposes to list motor vehicle tires that contain zinc as a Priority Product. PAHs are included on DTSC's Candidate Chemicals List as they are known to be a toxicant that is very persistent and bioaccumulative. CPs are also included in DTSC's Candidate Chemicals List. At this time, it is unknown if these and other hazardous substances in tires will eventually be reduced or removed, but regulatory procedures indicate that this is at least a likely possibility.

As discussed in Section 3.1, *Utilities and Service Systems: Solid Waste*, the CEC staff do not expect the RTEP regulations to cause an increase in the number of waste tires generated in the state. Therefore, the CEC staff do not expect the RTEP to contribute to any effects related to the disposal of tires or the hazardous substances they contain.

Part of the proposed RTEP is a requirement to revisit the regulations and standards at least every three years to determine if any adjustments are needed. This will ensure that the standards are effective and do not result in any unintended consequences that are currently unforeseeable, such as reduced tread life, increased consumer costs, or significant increased use of hazardous substances in tires.

Conclusion

While it is not known exactly how manufacturers will choose to modify replacement tires to reduce their rolling resistance, the CEC staff do not expect the RTEP to cause tire rubber to be modified in any way that would significantly increase the amounts of hazardous substances in tires. In particular, the CEC staff have concluded that it is not reasonable to expect the RTEP to cause an increase in the use of additives that do not improve the rolling resistance of tire rubber. This includes the use of antiozonants (e.g., 6PPD) and antioxidants as they do not improve the rolling resistance of tires. The RTEP standards are designed with the intent of avoiding any significant increase in tread wear that would reduce the average life of replacement tires. If the intent of the standards is realized in this regard, the RTEP would not result in an increase in the shedding of TWPs that can release harmful chemicals into the environment. For these reasons, the CEC staff have concluded that the implementation of the RTEP is unlikely to substantially increase any hazards to the public or the environment associated with the routine transport, use, or disposal of replacement tires. Therefore, impacts would be less than significant.

3.2.3.3 Cumulative Impacts

Cumulatively, the use of tires on California's roadways has a substantial impact on the environment. While tires are necessary for most forms of vehicular ground transportation, including passenger cars and light-duty trucks, they contribute to pollution in the form of TWPs that are shed from tire rubber. Just as particulate matter, TWPs are a pollutant, but they also contain various harmful chemicals. Although the quantities of such chemicals in TWPs are relatively small, the volume of TWPs generated by the use of tires on roadways is substantial, resulting in dispersal of harmful substances into the environment.

The CEC staffs do not expect the RTEP to make a considerable contribution to cumulative impacts related to hazardous substances in tires. As discussed above, the RTEP standards have been crafted with the intent of avoiding any significant increase in tread wear that would reduce the average life of replacement tires. As a result, the RTEP is not expected to result in an increase in the shedding of TWPs that can release harmful chemicals into the environment. Therefore, the CEC staff have concluded that the RTEP would not make a considerable contribution to the introduction of hazardous substances into the environment.

3.3 Air Quality

This section describes the project's environmental and regulatory setting and discusses potential impacts related to air pollutants, as they may be associated with adoption of the RTEP. Air quality impact analysis focuses on potential emissions of air pollutants from motor vehicles, including tire wear. The analysis assumes that the driving habits of Californians won't change due to the RTEP and that there will be no change in miles driven on California's roads because of the implementation of the RTEP.

The USEPA has oversight of state air quality programs, and the California Air Resources Board (CARB) and USEPA each have the responsibility to establish ambient air quality standards for certain pollutants. Generally, state law designates local air districts as having primary responsibility for the control of air pollution from all sources other than mobile sources while the control of vehicular air sources is the responsibility of CARB (California HSC section 39002) Additionally, CARB is charged with coordinating efforts to attain and maintain the ambient air quality standards (California HSC section 39003). Local air districts adopt rules and the air quality management plans to demonstrate attainment and/or maintenance of the standards for protecting public health and reducing emissions (California HSC section 40001).

The federal Clean Air Act requires USEPA to define the National Ambient Air Quality Standards (NAAQS) for pollutants called criteria air pollutants, based on their adverse health effects. The USEPA established NAAQS for ozone, carbon monoxide (CO), nitrogen dioxide (NO_2), particulate matter of 10 micrometers or less in diameter (PM10), particulate matter of 2.5 micrometers and smaller in diameter (PM2.5), sulfur dioxide (SO_2), and lead. Primary standards were set to protect public health; secondary

standards were set to protect public welfare against visibility impairment, damage to animals, crops, vegetation, and buildings. Sources of nitrogen oxides (NOx) and volatile organic compounds (VOC) or reactive organic gases (ROG) are also regulated as these pollutants are precursors to ozone formation through photochemical reactions in the ambient air. In addition, the USEPA has established emission standards for mobile sources including motor vehicles, vessels, trains, and off-road equipment. Periodically, the standards are reviewed and revised.

3.3.1 Environmental Setting

3.3.1.1 Tire Wear Particles

Motor vehicles emit inhalable particles from two major sources: the exhaust system; and non-exhaust sources, including brake wear, tire and road wear, clutch wear, and road dust resuspension. The non-exhaust sources of traffic-related emissions are unregulated because they are difficult to measure and control. Tire materials, driving behavior, and road conditions influence the release of tire and road wear as particulate matter to the atmosphere (CARB 2024a).

Although tire wear emissions have not been regulated in California, CARB sponsors research on how brake and tire materials, driving behaviors, and roadway conditions (including travel speed, traffic, road geometry, and pavement types) can affect brake- and tire-wear PM emissions. These studies, titled "Characterization of Tire-Wear and Brake-Wear PM Emissions Under On-Road Driving Conditions" and "Real-World Tire and Brake-Wear Emissions" are to understand the emission impact of moving to electric vehicles, and to inform relevant health impact studies and programs (CARB 2020; 2024a). Airborne brake-wear and tire-wear PM is generated during vehicle deceleration and acceleration when shear forces increase between braking friction material and disk and between tire and road, respectively. Brake- and tire-wear PM emissions are known to contain heavy metals that potentially cause adverse health effects (CARB 2020; 2024a).

Tire wear particles primarily enter the environment as they are abraded from tires during driving due to friction between the tires and the road surface. The range of particle sizes varies, and most of the volume and mass of tire wear particles are coarse and not likely to be entrained into the atmosphere. However, the largest numbers of particles are fine and ultrafine, or less than 10 micrometers (µm) and 2.5 µm, respectively. These particles are inhalable (PM10 or PM2.5) and found in airborne emissions especially close to streets (Mayer et al. 2024).

3.3.1.2 Scrap Tires

Scrap tires and solid waste streams may also constitute an existing air pollution hazard through the fire hazard of improper storage and disposal of used tires. If subjected to fire conditions tires can burn rapidly, emitting intense heat and large quantities of toxic smoke, becoming difficult to extinguish. Pollutants caused by a tire fire include

hazardous compounds including gases, heavy metals, and oil. Air pollutant emissions may include polycyclic aromatic hydrocarbons (PAHs), benzene, styrene, phenols, and butadiene (USEPA 2016).

3.3.1.3 Statewide Emissions Inventory and Projections

The exhaust emissions, and the break wear and tire wear components of non-exhaust emissions, are included in statewide emissions inventory data within the "On-Road Motor Vehicles" category of mobile sources. The CARB maintains this inventory and develops forecasts, derived from a 2017 base year inventory.

Table 3.3-1 summarizes the statewide emissions inventory and projections for NOx by sector, and Table 3.3-2 summarizes the statewide emissions inventory and projections for PM2.5 (CARB 2024c).

Table 3.3-1: California NOx Emissions Inventory (tons per day)

Statewide	2020	2025	2030	2035
Stationary Sources				
Fuel Combustion	151.6	147.7	141.5	139.7
Waste Disposal	4.0	3.9	4.0	4.0
Cleaning and Surface Coatings	0.1	0.1	0.1	0.1
Petroleum Production and Marketing	3.6	3.2	2.7	2.4
Industrial Processes	48.3	50.1	50.2	51.2
Total Stationary Sources	**207.5**	**205.0**	**198.5**	**197.4**
Areawide Sources				
Solvent Evaporation	-	-	-	-
Miscellaneous Processes	68.9	64.0	60.2	58.0
Total Areawide Sources	**68.9**	**64.0**	**60.2**	**58.0**
Mobile Sources				
On-Road Motor Vehicles	457.6	294.6	258.2	229.5
Other Mobile Sources	605.4	599.7	628.8	614.7
Total Mobile Sources	**1,063.0**	**894.2**	**887.0**	**844.2**
Grand Total for Statewide	**1,339.4**	**1,163.2**	**1,145.7**	**1,099.7**

Notes: Estimated annual average emissions, per forecasts derived from a 2017 base year inventory.
Source: CARB 2024c. CEPAM2019v1.03 database query.

Table 3.3-2: California PM2.5 Emissions Inventory (tons per day)

Statewide	2020	2025	2030	2035
Stationary Sources				
Fuel Combustion	22.7	22.5	22.0	22.2
Waste Disposal	1.5	1.5	1.6	1.6
Cleaning and Surface Coatings	2.1	2.2	2.2	2.3
Petroleum Production and Marketing	3.0	3.1	3.2	3.2
Industrial Processes	28.6	30.3	31.2	32.3
Total Stationary Sources	**57.8**	**59.5**	**60.3**	**61.6**
Areawide Sources				
Solvent Evaporation	0.0	0.0	0.0	0.0
Miscellaneous Processes	258.7	261.3	265.1	266.5
Total Areawide Sources	**258.7**	**261.4**	**265.2**	**266.6**
Mobile Sources				
On-Road Motor Vehicles	27.8	25.2	25.8	25.6
Other Mobile Sources	27.2	24.7	23.7	23.0
Total Mobile Sources	**55.0**	**49.9**	**49.4**	**48.6**
Grand Total for Statewide	**371.5**	**370.8**	**374.9**	**376.8**

Notes: Estimated annual average emissions, per forecasts derived from a 2017 base year inventory.
Source: CARB 2024c. CEPAM2019v1.03 database query.

3.3.1.4 Health Effects of Criteria Air Pollutants

The California Health and Safety Code, section 39606 requires CARB to adopt ambient air quality standards at levels that adequately protect the health of the public, including infants and children, with an adequate margin of safety. Ambient air quality standards define clean air conditions in terms of the following criteria air pollutants. Below are descriptions of the health effects of criteria pollutants that are a statewide concern.

Ozone

Ozone is a respiratory irritant and an oxidant that increases susceptibility to respiratory infections and that can cause substantial damage to vegetation and other materials. Ozone is not emitted directly into the atmosphere but is a secondary air pollutant produced in the atmosphere through a complex series of photochemical reactions involving ROG and NOx, including NO_2. Significant ozone production generally requires

ozone precursors (ROG and NOx) to be present in a stable atmosphere with strong sunlight.

Ozone can cause the muscles in the airways to constrict, trapping air in the alveoli of the lungs, potentially leading to wheezing and shortness of breath. Ozone can make it more difficult to breathe deeply and vigorously; cause shortness of breath and pain when taking a deep breath; cause coughing and sore or scratchy throat; inflame and damage the airways; aggravate lung diseases such as asthma, emphysema, and chronic bronchitis; increase the frequency of asthma attacks; make the lungs more susceptible to infection; continue to damage the lungs even when the symptoms have disappeared; and cause chronic obstructive pulmonary disease. Long-term exposure to ozone is linked to aggravation of asthma and may be one of many causes of asthma development. Long-term exposures to higher concentrations of ozone may also be linked to permanent lung damage, such as abnormal lung development in children. The inhalation of ozone causes inflammation and irritation of the tissues lining human airways, causing and worsening a variety of symptoms, and exposure to ozone can reduce the volume of air that the lungs breathe in and cause shortness of breath.

People most at risk for adverse health effects from breathing air containing ozone include people with asthma, children, older adults, and people who are active outdoors, especially outdoor workers. Children are at greatest risk from exposure to ozone because their lungs are still developing and they are more likely to be active outdoors when ozone levels are high, which increases their exposure. Studies show that children are no more or less likely to suffer harmful effects than adults; however, children and teens may be more susceptible to ozone and other pollutants because they spend nearly twice as much time outdoors and engaged in vigorous activities compared to adults. Children breathe more rapidly than adults and inhale more pollution per pound of their body weight than adults and are less likely than adults to notice their own symptoms and avoid harmful exposures.

Particulate Matter

PM10 and PM2.5 represent size fractions of particulate matter that can be inhaled into air passages and the lungs and can cause adverse health effects. Very small particles of certain substances (e.g., sulfates and nitrates) can cause lung damage directly, or can contain absorbed gases (e.g., chlorides or ammonium) that may be injurious to health. The health effects of particulate matter may include cardiovascular effects, such as cardiac arrhythmias and heart attacks, and respiratory effects, such as asthma attacks and bronchitis. Particulates can also reduce visibility.

Nitrogen Dioxide

Breathing air with a high concentration of NO_2 can irritate airways in the human respiratory system. Such exposures over short periods (as represented by the 1-hour standards) can aggravate respiratory diseases, particularly asthma, leading to respiratory symptoms (such as coughing, wheezing or difficulty breathing), hospital

admissions and visits to emergency rooms. Longer exposures to elevated concentrations of NO_2 (as represented by the annual standards) may contribute to the development of asthma and potentially increase susceptibility to respiratory infections. People with asthma, as well as children and the elderly are generally at greater risk for the health effects of NO_2. Emissions of NOx, which includes NO_2 and nitric oxide (NO), react with other chemicals in the air and sunlight to form both particulate matter and ozone.

Carbon Monoxide

CO is a pollutant that is a product of incomplete combustion and is mostly associated with motor vehicle traffic. High CO concentrations develop primarily during winter when periods of light winds combine with the formation of ground level temperature inversions (typically from the evening through early morning). These conditions result in reduced dispersion of vehicle emissions. Motor vehicles also exhibit increased CO emission rates at low air temperatures. When inhaled at high concentrations, CO combines with hemoglobin in the blood and reduces the oxygen-carrying capacity of the blood. This results in reduced oxygen reaching the brain, heart, and other body tissues. This condition is especially critical for people with cardiovascular diseases, chronic lung disease, or anemia.

Sulfur Dioxide

SO_2 is produced through the combustion of sulfur or sulfur-containing fuels such as coal. SO_2 is also a precursor to the formation of atmospheric sulfate and particulate matter (PM10 and PM2.5) and contributes to potential atmospheric sulfuric acid formation that could precipitate downwind as acid rain.

Lead

Lead has a range of adverse neurotoxin health effects and was predominately released into the atmosphere primarily via the combustion of leaded gasoline. The phase-out of leaded gasoline has resulted in decreasing levels of atmospheric lead.

3.3.1.5 Toxic Air Contaminants

Concentrations of toxic air contaminants (TACs) are also used to indicate the quality of ambient air. California defines a TAC as "an air pollutant that may cause or contribute to an increase in mortality or in serious illness, or that may pose a hazard to human health...." (California HSC section 39655(a)). TACs are usually present in minute quantities in the ambient air; however, their high toxicity or health risk may pose a threat to public health even at low concentrations.

Toxic diesel particulate matter (DPM) emissions from combustion of diesel fuel in motor vehicles and off-road equipment are the primary source of air toxics risk in California. Examples of sources contributing to substantial DPM emissions and higher health risks include ports, rail yards, and distribution centers. DPM accounts for approximately 60 percent of the current estimated inhalation cancer risk for background ambient air. The

combustion and evaporation of gasoline used in motor vehicles and other smaller equipment also produce toxins such as benzene.

3.3.2 Regulatory Setting

Existing regulations, primarily the federal Clean Air Act, help reduce or avoid environmental impacts related to air quality. These regulations are described below.

- **Federal Clean Air Act.** The federal Clean Air Act (CAA) (42 U.S.C. section 7401 et seq.) establishes the statutory framework for regulation of air quality in the United States. Under the CAA, the USEPA oversees the implementation of federal programs for permitting new and modified stationary sources, controlling toxic air contaminants, and reducing emissions from motor vehicles and other mobile sources. Title I (Air Pollution Prevention and Control) of CAA requires establishment of National Ambient Air Quality Standards (NAAQS), air quality designations, and plan requirements for nonattainment areas. States are required to submit a State Implementation Plan (SIP) to the USEPA for areas in nonattainment with NAAQS. The SIP must demonstrate how state and local regulatory agencies will institute rules, regulations, and other programs to attain NAAQS. Once approved by the USEPA and published in the Federal Register, the local air district rules contained in the SIP become federally enforceable. State law makes CARB the lead agency for all purposes related to the components that are included in the California SIP. For all local air districts in California, the SIP relies on the same core set of control strategies, including fuel economy standards, emission standards for cars and heavy trucks, fuel regulations and limits on emissions from consumer products (CARB 2024b). The CAA also required the USEPA to promulgate vehicle or fuel standards containing reasonable requirements that control TAC emissions, at a minimum to benzene and formaldehyde. Performance criteria were established to limit mobile-source emissions of toxics, including benzene, formaldehyde, and 1,3-butadiene. In addition, Section 219 required the use of reformulated gasoline in selected areas with the most severe ozone nonattainment conditions to further reduce mobile-source emissions.
- **National Emission Standards for Hazardous Air Pollutants.** The National Emission Standards for Hazardous Air Pollutants (NESHAP), set by the USEPA, require all major sources not covered by NAAQS to meet Hazardous Air Pollutants emission standards that reflect the application of maximum achievable control technology (MACT). This action finalizes standards for new and existing sources at rubber tire manufacturing facilities, including tires used for agricultural equipment, airplanes, and on road vehicles such as cars, buses, and trucks. These standards regulate sources such as rubber processing; the use of cements, solvents, and associated additive mixtures in tire production; tire cord production; and puncture sealant application. The USEPA has identified rubber tire manufacturing facilities as major sources of hazardous air pollutant (HAP) emissions. These standards implement section 112(d) of the CAA by requiring all

such major sources to meet HAP emission standards that reflect the application of MACT. Regulated HAPs include hexane, toluene, formaldehyde, styrene and methanol, which are associated with a variety of adverse health effects such as chronic health disorders (e.g., polyneuropathy, degenerative lesions of the nasal cavity) and acute health disorders (e.g., respiratory irritation, nausea, blurred vision, and headaches). Through the implementation of NESHAPs, the USEPA reduces approximately 1,100 tons per year of air toxic emissions from solvents, cements and coating material used in the tire manufacturing industry (USEPA 2024e).

3.3.3 Environmental Impacts

3.3.3.1 Impact Significance Criteria

The significance criteria used to evaluate the project's impacts related to air quality are derived from the environmental checklist in Appendix G of the State CEQA Guidelines. According to Appendix G of the State CEQA Guidelines, a significant impact would occur if the project would:

(a) Conflict with or obstruct implementation of the applicable air quality plan.

(b) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard.

(c) Expose sensitive receptors to substantial pollutant concentrations.

(d) Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people.

For reasons provided in Appendix A, *Initial Study*, CEC staff conclude that some of the significance criteria listed above are not applicable to the proposed RTEP, primarily because the RTEP has no physical site location and, therefore, would not have a physical presence in the environment that could trigger impacts related to most of the listed criteria. As a result, there is no potential for impacts to occur related to those significance criteria. Therefore, the significance criterion addressed in this section is **criterion (b)**, which relates to the potential of the RTEP to result in emissions increases that could contribute to nonattainment conditions.

3.3.3.2 Direct and Indirect Impacts

Cumulatively Considerable Net Increases of Criteria Pollutants

The CEC staff estimates the potential annual reduction in criteria air pollutant emissions to be 426 tons of NOx and 10 tons of PM2.5 in 2035, assuming a 90 percent compliance rate with the proposed project (Blackburn et al. 2026, Chapter 9).

The RTEP design ensures that the program would not increase air pollutant emissions related to fuel use in the transportation sector. The RTEP is also designed to avoid increasing tire wear for replacement tires, and to avoid causing particulate matter emission increases due to tire wear. As a result, the CEC staff have concluded that the implementation of the RTEP is not likely to cause any increase in air pollutant emissions that could have a significant impact on the environment.

Conclusion

The CEC staff do not expect the RTEP to cause an increase in vehicle exhaust or tire-wear-related emissions. CEC staff designed the RTEP standards with the intent of improving fuel efficiency and avoiding any significant increase in tread wear. For these reasons, the CEC staff have concluded that the implementation of the RTEP is not likely to result in a substantial increase in motor vehicle exhaust or tire-wear-related emissions. Therefore, air quality impacts would be less than significant.

3.3.3.3 Cumulative Impacts

As discussed above, use of transportation fuels and tires contribute to air pollution in the form of combustion products in vehicle exhaust and tire wear particles. The RTEP minimum performance standards for rolling resistance have been crafted with the intent of improving fuel efficiency and avoiding any significant increase in tread wear. As a result, the RTEP is not expected to result in an increase in motor vehicle exhaust or tire wear emissions and, therefore, would not increase air pollutant emissions in any amount that would be cumulatively at considerable levels. For these reasons, the CEC staff have concluded that RTEP is not likely to change baseline conditions related to motor vehicle exhaust or tire wear emissions. Therefore, the RTEP would not make a considerable contribution to adverse cumulative impacts related to motor vehicle exhaust or tire wear emissions.

3.4 Biological Resources

This section describes potential impacts on biological resources from the implementation of the proposed RTEP. An overview of wildlife, vegetation, and habitat in California is provided in the environmental setting section. The impact analysis focuses on chemicals in tire rubber introduced into the environment through tire wear particles and their effects on wildlife and habitat. Particular emphasis is placed on the aquatic environment where tire wear particles present significant concerns.

3.4.1 Environmental Setting

California covers an area of 163,696 square miles and is among the country's most geographically diverse states. Land resources make up 95.28 percent of California while water areas make up 4.72 percent of the state (eReferenceDesk 2024). This diverse landscape can be described relative to its mountain ranges, broad valleys, and deserts. In the northern region, California supports the Klamath Mountains, Cascades Ranges,

and rugged Coastal Ranges. Broad valleys and plateaus in this area include portions of the Central Valley and Modoc plateau. Prominent along the central and eastern portions of the state are the Sierra Nevada Mountains, the fertile farmlands of the Central Valley, and the arid Owens Valley. To the south, the transverse and peninsular ranges define the Southern San Joaquin Valley, the San Fernando Valley, Antelope Valley, and other areas. The Mojave and Colorado Deserts also comprise much of the land area in southern California. California's mountain systems dissect the state into a series of physiographic regions, and these regions are west or east of the Sierra Nevada and referred to as Cismontane and Transmontane California, respectively (CGS 2010, Muir 1894). Most of the state of California can be described as cismontane, or near mountains, and includes coastal beaches, fertile valleys, rolling hills, and expansive forests. Within each of these areas are additional major topographic features.

California's climate is as diverse as its topography and influenced by its vast geography. Coastal areas in central and southern California experience a Mediterranean climate, characterized by mild, wet winters and warm, dry summers. Southern California features desert climates, with extremely hot summers and mild winters. Northern California has a mix of Mediterranean and cooler coastal climates, with more rainfall and diverse forest ecosystems. Overall, California's climate ranges from cool and foggy to hot and arid, depending on the region. Snow is common at higher elevations and runoff provides water to the numerous large rivers and streams that occur across the state.

The diversity of vegetation and wildlife in California is due to its varied climate, topography, and soil types. The main vegetation types classified in California include forests, chaparral, grasslands, desert, wetlands, savannah, mediterranean forests, and alpine. The *Manual of California Vegetation* describes over 450 vegetation types throughout California (Sawyer et al. 2009). California also supports a diverse range of wildlife and the California Department of Fish and Wildlife (CDFW) lists over 600 species as threatened or endangered (CNDDB 2024a, 2024b). These include approximately 400 plant species and over 200 wildlife species (including various mammals, birds, reptiles, amphibians, fish). California has around 15 species listed as state candidate species, which are under consideration for listing as threatened or endangered.

California is also home to many species considered rare by the federal government. There are approximately 140 species listed as threatened or endangered under the federal Endangered Species Act (ESA) and 11 wildlife species that are under consideration for listing as threatened or endangered under the federal ESA (CNDDB 2024a). Critical habitat for many listed species is also present across large portions of the state. Critical habitat is a designation made under the federal ESA for specific areas essential for the conservation of a threatened or endangered species. The purpose of critical habitat is to ensure that the habitats necessary for the survival and recovery of species are protected from adverse modifications. Areas are designated as critical habitat based on their importance for the species' life processes, such as breeding,

feeding, and shelter. In California, critical habitat has been designated or proposed for over 140 species under the federal ESA (USFWS 2024). This includes various plants, animals, and marine organisms. The designation of critical habitat is intended to provide additional protection and help conserve the species' ecosystems.

California's diverse geography, ranging from its coastal areas to its steep mountains and expansive deserts, results in a broad variety of watershed types. The state is divided into several major watersheds, each with its own ecological and hydrological characteristics. At the largest scale, California is divided into 10 hydrologic regions, each representing a distinct watershed system. These regions include North Coast, San Francisco Bay, Central Coast, South Coast, Sacramento River Basin, San Joaquin River Basin, Tulare Lake Basin, North Lahontan, South Lahontan, and Colorado River. Each of these major watersheds are subdivided into smaller sub-watersheds, each with its own unique ecological function. The state's complex geology and varying climate conditions contribute to the vast array of hydrological features found within these regions, from perennial rivers and seasonal streams to wetlands and groundwater basins. These watersheds not only define the flow of water through the state's rivers, lakes, and streams but also support a wide variety of ecosystems, agricultural production, and urban development.

Wetlands occur throughout California and include marshes that are dominated by herbaceous plants, often found near rivers and lakes; swamps which contain woody vegetation and saturated soils, often near slow-moving waters; and riparian zones which are areas where vegetation covers the riverbanks, consisting of willows, cottonwoods, and other moisture-loving plants. California is home to a diverse range of wetlands, which are crucial for biodiversity, water quality, and flood control. There are many types of wetlands that can be found in the state. Marshes are characterized by herbaceous (non-woody) plants and are often found along the coasts, in river deltas, and in floodplains. Swamps are dominated by woody plants and can be freshwater or saltwater. Bogs are acidic and nutrient-poor, while fens are more alkaline and support a variety of plant life. These are less common in California with the exception of some high elevation wetlands in the Sierra Nevada which can exhibit characteristics of bogs and fens. Riparian wetlands occur along the banks of rivers and streams, characterized by vegetation that thrives in moist conditions. Estuarine wetlands are located where freshwater meets saltwater, these wetlands are vital for nutrient cycling and support diverse ecosystems. These areas include tidal marshes and mudflats that provide habitat for migratory birds and fish. Pond and lake wetlands can be seasonal or permanent water bodies that support wetland vegetation. An example is Mono Lake, which is a saline lake with surrounding wetlands that support migratory birds.

California's wetlands face numerous threats, including urban development, agricultural expansion, and climate change. Changes in precipitation patterns and sea-level rise threaten wetland habitats. Many wetlands have been drained or filled for development. Initiatives to restore degraded wetlands are ongoing in many areas, focusing on

reestablishing natural hydrology and native vegetation. Wetlands are vital to California's environment by supporting wildlife, improving water quality, and providing recreational opportunities. Their conservation is essential for maintaining the state's ecological health.

California has nearly 415,000 lane miles of public roads, providing it with the most extensive road networks in the United States (Caltrans 2022). This includes federal, state, and local roads, encompassing highways, streets, and rural routes. Many of these major roads and highways follow alongside major rivers, through a variety of ecosystems and biomes in the state that provide habitat to state and federal listed species. Some of these highways include:

- Interstate 5 runs alongside a substantial portion of the Sacramento River. The Sacramento River provides habitat for endangered species including the Central Valley steelhead (*Oncorhynchus mykiss*) and the Sacramento River winter-run Chinook salmon (*Oncorhynchus tshawytscha*) (Quiñones and Moyle 2015, NMFS 2019). These species rely on the river for spawning and habitat.
- State Route 99 follows the San Joaquin River closely in its lower reaches. The San Joaquin River is critical for the recovery of the fall-run San Joaquin Valley Chinook salmon (*Oncorhynchus tshawytscha*) and the endangered Delta smelt (*Hypomesus transpacificus*), which depend on the river's ecosystem (Quiñones and Moyle 2015).
- U.S. Route 101 runs near parts of the Klamath River. This river supports several endangered species, including the Southern Oregon/Northern California Coast coho salmon (*Oncorhynchus kisutch*) (NOAA 2021) and the Lost River and shortnose suckers (*Deltistes luxatus*) (USFWS 2012, USFWS 2019).
- Highway 50 runs adjacent to parts of the American River. The American River is home to the Central Valley steelhead (*Oncorhynchus mykiss*), which faces threats from habitat loss and water management practices (Katz 2010).
- Interstate 80 follows the Truckee River as it flows from Lake Tahoe to Reno, providing scenic views. The Lahontan cutthroat trout, once endangered, has been the focus of recovery efforts in the Truckee River watershed (USFWS 2025).
- Highway 101 and State Route 116 run near the Russian River, providing access to scenic areas in Sonoma County. The Russian River supports several fish species, including the coho salmon and steelhead trout which are listed as endangered (Quiñones and Moyle 2015, RRWA 2021).

Another important characteristic of many California ecosystems is wildfire. California has been marked by the increasing frequency and intensity of wildfires (CAL FIRE 2024a) and is prone to wildfires due to a combination of factors, including its climate, vegetation, and topography. Rising temperatures and changing precipitation patterns

have created drier conditions, increasing fire risks. Expansion of urban areas into wildland areas has led to more frequent interactions between fires and communities. Overgrown forests due to decades of fire suppression have also contributed to larger, more intense fires (USDA 2024).

In summary, California is characterized by its rich biodiversity, hosting a variety of habitats ranging from coastal wetlands and riparian zones to grasslands, forested areas, and deserts. This diversity supports numerous species, including many that are sensitive, threatened, or endangered.

3.4.2 Regulatory Setting

Existing federal and state regulations help reduce or avoid impacts on biological resources, including wildlife, plant life, and sensitive habitats. The most relevant of these regulations are described below.

- **Endangered Species Act (16 U.S.C. section 1531 *et seq.*, and 50 C.F.R. section 17.1 et seq.).** The Endangered Species Act (ESA) designates and provides for protection of threatened and endangered plant and animal species, and their critical habitat. Its purpose is to protect and recover imperiled species and the ecosystems for which they depend. It is administered by the U.S. Fish and Wildlife Service (USFWS) and the National Marine Fisheries Service (NMFS). The USFWS is responsible for terrestrial and freshwater organisms while NMFS is responsible for marine wildlife such as whales and anadromous fish (such as salmon). Species may be listed as endangered or threatened. The ESA protects endangered and threatened species and their habitats by prohibiting the "take" of listed animals and the interstate or international trade in listed plants and animals, including their parts and products, except under federal permit. "Take" is broadly defined in ESA to include "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, collect, or attempt to engage in any such conduct" (16 U.S.C. section 1532(19)). Take can also include significant habitat modification or degradation that directly results in death or injury to a listed wildlife species by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering (50 C.F.R. section 17.3). Take of federally listed species as defined in the ESA is prohibited without incidental take authorization, which may be obtained through Section 7 consultation (between federal agencies) or a Section 10 Habitat Conservation Plan.
- **Clean Water Act Sections 401 and 404 (33 U.S.C. sections 1251—1376).** The Clean Water Act (CWA) requires the permitting and monitoring of all discharges to surface water bodies. Section 404 (33 U.S.C. section 1344) requires a permit for the discharge of dredged or fill materials into a water of the United States, including wetlands. Section 401 (33 U.S.C. section 1341) requires a permit from the regional water quality control board for the discharge of pollutants. By federal law, every applicant for a federal permit or license for an activity that may result in a discharge into a California water body, including

wetlands, must request state certification that the proposed activity will not violate state and federal water quality standards. The administering agencies are the United States Army Corps of Engineers (Section 404) and the State or Regional Water Quality Control Board (Section 401).

- **California Endangered Species Act (California Fish and Game Code [CFGC] sections 2050-2098).** The California Endangered Species Act (CESA) of 1984 states that all native species of fish, amphibians, reptiles, birds, mammals, invertebrates, and plants, and their habitats, threatened with extinction and those experiencing a significant decline which, if not halted, would lead to a threatened or endangered designation, will be protected and preserved. CESA prohibits the take of any species of wildlife designated by the California Fish and Game Commission as endangered, threatened, or candidate species. The CDFW may authorize the take of any such species if certain conditions are met. For purposes of CESA, "take" means to hunt, pursue, catch, capture, or kill (CFGC section 86). The administering agency is the California Department of Fish and Wildlife.
- **Porter-Cologne Water Quality Control Act (Calif. Water Code Division 7).** The State Water Resources Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs) have jurisdiction over all surface water and groundwater in California, including wetlands, headwaters, and riparian areas. The SWRCB or applicable RWQCB must issue waste discharge requirements for any activity that discharges waste that could affect the quality of waters of the state.

3.4.3 Environmental Impacts

3.4.3.1 Impact Significance Criteria

The significance criteria used to evaluate the project's impacts related to biological resources are derived from the environmental checklist in Appendix G of the State CEQA Guidelines. According to Appendix G of the State CEQA Guidelines, a significant impact would occur if the project would:

(a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.

(b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service.

(c) Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

(d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors or impede the use of wildlife nursery sites.

(e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance.

(f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Communities Conservation Plan, or other approved local, regional, or state habitat conservation plan.

For reasons provided in Appendix A, *Initial Study*, the CEC staff concluded that many of the significance criteria listed above are not applicable to the proposed RTEP, primarily because the RTEP has no physical site location and, therefore, would not have a physical presence in the environment that could trigger impacts related to most of the listed criteria. As a result, there is no potential for impacts to occur related to those significance criteria. Therefore, the significance criteria addressed in this section are **criteria (a), (b), and (c)**, which relate to the potential of the RTEP to cause direct or indirect adverse effects on sensitive species, riparian habitat, sensitive natural communities, or protected wetlands.

3.4.3.2 Direct and Indirect Impacts

Known Effects of Tire Chemicals on Biological Resources

Numerous raw materials are combined to produce tires. A wide variety of natural or synthetic elastomers, fillers (e.g., carbon black, precipitated silica, or silicates), and additives are used in compounding to create the necessary properties for the final rubber product (see Section 3.2.1 for additional information on materials used to produce tires). Tires and the chemicals used to manufacture them are known to have certain adverse consequences for biological resources. Specifically, studies have shown that tire chemicals such as phenyl-p-phenylenediamine (6PPD); 2,6-di-tert-butyl-4-methylphenol (BHT); polycyclic aromatic hydrocarbons (PAHs), including benzo[a]pyrene; chlorinated paraffins (CPs); vulcanizing additives such as 1,3-diphenylguanidine (DPG); and zinc are toxic to aquatic life at multiple trophic levels (DTSC 2021).

6PPD (phenyl-p-phenylenediamine)

6PPD, a chemical that has been linked to adverse effects on coho salmon, is a compound universally found in tire rubber to improve its durability. 6PPD is the most commonly used chemical antioxidant (also referred to as an "antidegradant" or

"antiozonant") in tires (Sellers et al. 2024). The migration and transformation of 6PPD to its quinone oxidation product (referred to as 6PPD-Q) in the environment is suspected to cause urban run-off mortality syndrome (URMS) which can result in mass die-offs and pre-spawn mortality in coho salmon, and may have potential to cause adverse effects on other aquatic species (DTSC 2022; Tian et al. 2021, 2022; Peter et al. 2018; Hu et al. 2023; Chow et al. 2019; McIntyre et al. 2021).

6PPD is, by design, highly reactive and transforms into a number of reaction products, both known and unknown, at the surface of the tire or when released into the environment. 6PPD and other chemicals enter the environment when tire wear particles (TWPs) end up on roads. As discussed in Section 3.2.1.2, *Tire Wear Particles,* TWPs are shed from tire rubber as tires roll across pavement and are distributed to soil and sediment, eventually making their way into waterways. A myriad of chemicals may be found in tire material, of which several are considered to be more harmful than others when exposed to ecological resources through the generation of TWPs. Chemical additives (for example, 6PPD) in TWP are introduced into the environment as parent compounds, transformation products (TPs), or hydrolysis products[49] (Unice et al. 2015). The Unice et al. study (2015) successfully established a robust experimental framework using column-leaching studies to evaluate the leaching behavior of organic chemicals from TWPs. The findings highlighted that TWPs can release organic contaminants into the environment, which can pose risks to aquatic ecosystems.

Different matrices (various materials or substances in the natural environment) interact with chemicals in distinct ways. The organic and inorganic composition of soil can affect how chemicals are absorbed, retained, or leached (Hu et al. 2023). Similar to soil, sediments in water bodies can interact with contaminants, influencing their bioavailability and degradation (Unice et al. 2015). The properties and solutes in water (e.g., pH, presence of dissolved organic matter) can affect how pollutants behave (Cao et al. 2022). Organic materials like plant matter can also act as matrices, affecting how chemicals are absorbed or broken down in the environment. Each of these matrices can influence the environmental fate of organic chemicals in unique ways, affecting their mobility, persistence, and toxicity (DTSC 2022).

Several studies have found that when 6PPD enters the environment via TWPs the chemical can interact with ozone and be transformed to the associated toxicant 6PPD-Q, which can end up in streams and rivers (Johannessen et al. 2021a, 2021b; Hu et al. 2023; Tian et al. 2021, 2022). As the Tian et al. study concluded, 6PPD leaches out of the TWP that tires shed onto the pavement as they roll across the road surfaces, particularly as vehicles brake and accelerate. The 6PPD-Q then becomes mobilized during a rain event, which can enter the aquatic environment through surface runoff and stormwater and make its way to coho salmon (*Oncorhynchus kisutch*) habitat (Tian 2021, 2022; Seiwert et al. 2022; Greer et al. 2023a). In 6PPD's Product-Chemical Profile in motor vehicle tires (DTSC 2022), DTSC notes that in coho salmon "behavioral

[49] Hydrolysis is any chemical reaction in which a molecule of water breaks one or more chemical bonds.

symptoms of the urban run-off mortality syndrome (URMS) occur within a few hours of exposure to urban runoff and include erratic surface swimming, gaping, fin splaying, and loss of orientation and equilibrium" (Scholz et al. 2011). Some other salmonid species may be similarly affected under certain circumstances, although with lower toxicology potency than coho, while other species apparently exhibit negligible toxicological susceptibility (Brinkmann et al. 2022, Hiki and Yamamoto 2022, Greer et al. 2023a). Studies have shown that the closely related Chinook salmon (Lo et al. 2023) and sockeye salmon (Greer et al. 2023a) are much less susceptible (Gradient 2024).

Lethal concentrations of 6PPD-Q have been determined for a range of species (coho, zebrafish larvae, rainbow trout, white sturgeon, water flea, and scud) (French et al. 2022, Brinkman et al. 2022, Di et al. 2022, Hiki et al. 2021, Varshney et al. 2022). Further research determined that 6PPD-Q has aquatic toxicity, reproductive toxicity, environmental persistence, and bioaccumulation potential, making it a chemical of concern (Fang et al. 2024). Some of the primary locations where threatened and endangered aquatic species occur in California include, but is not limited to, the Smith River, Trinity River, Klamath River, Russian River, Pescadero Creek; and the Laguna de Santa Rosa estuarine habitat which supports coho salmon in its tributaries. It is possible that 6PPD-Q may affect other aquatic and terrestrial organisms as well. However, more studies are needed to confirm the effects of 6PPD-Q on other aquatic species in their natural environment throughout the extensive landscape of California. Wildlife nursery sites may be more susceptible to acute mortality (Tian et al. 2021, Lo et al. 2023, Greer et al. 2023b), and additional research is necessary to conclude whether the chemical (or other tire chemicals) would have the same effect to coho salmon and other aquatic species throughout the state of California.

As mentioned, the degradation of 6PPD-Q in aquatic habitats is influenced by several factors including temperature, light exposure, microbial activity, pH levels of the water, presence of organic matter, sediment composition, flow rate and water movement, and other chemical interactions (Wei et al. 2024). These factors, if present, may cause 6PPD-Q to undergo oxidation and reduction reactions with other chemicals within riparian habitats, such as dissolved oxygen or natural organic matter, which can alter its structure and reduce its toxicity.

Research has suggested that microorganisms in sediment and water can metabolize 6PPD-Q, contributing to its breakdown (Wei et al. 2024). Therefore, the presence and diversity of microbial communities play a crucial role in the breakdown of chemicals and pollutants in the natural environment. The acidity or alkalinity of the water can affect the stability of 6PPD-Q and its susceptibility to degradation. The presence of organic materials can either enhance or inhibit degradation. High organic content may provide nutrients for microbial communities, while other compounds may react with 6PPD-Q. Different types of sediments can also influence the adsorption of 6PPD-Q, affecting its availability for degradation (Wei et al. 2024). Water movement can impact the concentration of 6PPD-Q in specific areas, facilitating or hindering microbial access and

degradation. 6PPD-Q may interact with other pollutants or chemicals in the environment, potentially leading to complex degradation pathways. The degradation pathways for 6PPD-Q can lead to the formation of less toxic substances, depending on the specific pathway and environmental conditions. Understanding these factors is essential for assessing the environmental impact of 6PPD-Q and developing strategies for its management in aquatic ecosystems. Therefore, it is challenging to conclude what effect 6PPD-Q might have across all riparian habitat communities throughout California without further research conducted to explore this topic.

In riparian habitat and within other sensitive natural communities throughout California, the extent of 6PPD-Q pollution in soils, specifically hydric soils in riparian habitats, remains unclear. One study (Wei et al. 2024) reports soil fungi exhibit higher sensitivity to 6PPD-Q accumulation compared to bacteria, and associated fungi (*Basidiomycota)* may be potential biomarkers for environmental 6PPD-Q contamination. Methods used in the Wei et al. 2024 study revealed that a bacterial microbial network in the summer exhibits greater stability and resilience in response to 6PPD-Q inputs in the winter. However, 6PPD-Q accumulation disrupts the network of fungal communities to some extent, leading to reduced diversity in fungal microbial communities (Wei et al. 2024). The study found that long-term accumulation of 6PPD-Q weakens the nitrogen and phosphorus cycling potential within urban soil, while the enhancement of carbon cycling may further promote 6PPD-Q degradation in urban soil (Wei et al. 2024). Therefore, 6PPD-Q may have similar effects on hydric soils in riparian environments.

The Cao et al. study (2022) found new evidence of rubber-derived quinones in water, air, and soil. The study found that *N,N'*-diphenyl-*p*-phenylenediamine (DPPD)-quinone (DPPD-Q) and 6PPD-Q were frequently detected (100 percent detection frequency) in runoff water, air particles, and roadside soils, indicating their widespread presence. Concentrations of 6PPD-Q were detected in air particles; and in runoff water, the detection was greater. DPPD-Q was predominantly found in air particles (75.9 percent), while 6PPD-Q was more concentrated in runoff water (48.8 percent) and roadside soil samples (75.7 percent) (Cao et al. 2022). A significant finding was that 88 percent of runoff water samples exceeded the lethal concentration (LC50) for 6PPD-Q observed in coho salmon (0.79 µg/L [micrograms per liter]), suggesting potential risks to aquatic organisms. The widespread occurrence of these quinones is attributed to the high production and usage of rubber-related products. The study emphasizes the need for further research on the ecological and health risks associated with PPD-Qs, particularly in urban environments. While there is no definitive evidence of bioaccumulation in mammals, the potential for toxicity from 6PPD and its breakdown products warrants further investigation.

As discussed above, various factors play a role in the breakdown of 6PPD in the environment (e.g., sunlight, moisture, heat, ozone, elevation, etc.). Heat can play a significant role in the breakdown of 6PPD. Sunlight and moisture can interact with heat to further impact the breakdown process. Overall, higher temperatures can enhance the

degradation of 6PPD, potentially leading to increased concentrations of its more toxic breakdown products in the environment (DTSC 2022). When exposed to elevated temperatures, 6PPD can degrade more quickly, leading to the formation of breakdown products, including 6PPD-Q (DTSC 2022). This process can occur in various environments, such as during tire wear on hot roads or in areas with high ambient temperatures. In addition, heat can influence chemical reactions that promote the transformation of 6PPD into other compounds, which can affect its environmental behavior and toxicity.

Recent studies have found that direct interactions between ozone and carbon atoms in 6PPD are critical, leading to the formation of hydroxylated intermediates that further react to produce 6PPD hydroquinone and ultimately 6PPD-Q (Rossomme et al. 2023). In another recent study, the lab-scale reaction of solid 6PPD and aqueous 6PPD with ozone gas, a total of 38 transformation products (TPs) were identified, with 26 of them being previously unreported in the literature (Seiwert et al. 2022). The reactions of 6PPD with ozone gas and ozone in water produced similar TPs, although with different relative yields. According to the findings in Seiwert et al., 6PPD undergoes oxidation to form benzoquinone imine, which then further transforms into 6PPD-Q as one of the major products through two subsequent oxygen additions. Similarly, the oxidative transformation of 6PPD-Q was investigated, leading to the detection of 12 additional TPs. Notably, all of these TPs were also observed during the zonation of 6PPD, indicating that 6PPD-Q undergoes further degradation in the presence of oxidants (Seiwert et al. 2022). More studies are necessary to determine whether other TPs result in adverse effects to the environment.

Regardless of the many considerations and factors at play during the chemical breakdown of 6PPD in the environment, 6PPD has the potential to result in adverse impacts to biological resources. Research has shown that severe and acute toxicity of 6PPD-Q to coho salmon is likely to have implications throughout California (DTSC 2022) as well as other states with rivers inhabited by coho salmon. Although significant declines in coho salmon populations in California were observed as early as the 1940s (CDFW 2002), pre-dating the use of 6PPD in tires by several decades (tire manufacturers began using 6PPD in the mid-1960s to early 1970s) (Gradient 2024), studies have suggested some adverse effects may occur from 6PPD. Additional studies are warranted to evaluate the long-term risk of tire chemicals on biological resources.

Other Chemicals of Concern

In addition to 6PPD, researchers have reported several other organic chemicals that leach from tire particles (Müller et al. 2021, Peter et al. 2018, Seiwert et al. 2020). As many as two hundred different materials are combined to produce tire rubber. These materials include natural rubber, synthetic rubber, steel, textiles (rayon, polyester, aramid, and nylon), and various additives, such as processing additives, vulcanizing additives, and antioxidants (see Section 3.2, *Hazardous Materials*). In addition, tires contain other fillers such as carbon black and silica, which enhance strength, durability,

and wear resistance (Sellers et al. 2024). Other chemicals are added (additives) to improve performance, such as antioxidants, curing agents, and plasticizers (see Section 3.2.1.3).

Some chemicals may be transformed in tires during their production and use, in TWPs as tires roll across road surfaces, or in aqueous environment after their release from TWPs (Wagner et al. 2018, 2022). Such transformation processes significantly enhance the number of compounds of potential environmental relevance. Therefore, 6PPD-Q (discussed above) is only one of several TPs that may have an effect on species and their environments (Unice et al. 2015).

BHT (2,6-di-tert-butyl-4-methylphenol)

Benzothiazole and its derivatives (BTs) are used in a number of consumer products, especially in rubber products. Several compounds of the BT group have been pointed out as persistent, mobile, and toxic (PMT) substances. BHT (2,6-di-tert-butyl-4-methylphenol) is a phenolic antioxidant and is considered to be a very toxic substance to aquatic life according to the European Chemical Agency, BTs undergo chemical, biological, and photolytic degradation in the environment, creating several TPs. This suggests that these PMT substances could potentially undergo long-range transport over extended periods after TWP is released into the environment.

Benzothiazoles cause both cytotoxicity and transitory elevation in reactive oxygen species levels in rainbow trout epithelial cell lines (Zeng et al. 2016). Chibwe et al. (2022) combined toxicity testing, using fathead minnow (*Pimephales promelas*) embryos, with nontarget high-resolution liquid chromatography Orbitrap mass spectrometry to characterize the toxicity and chemical mixture (which included benzothiazoles) of organic chemicals associated with the tire particle leachates. Chibwe et al. observed a decrease in embryonic heart rates, hatching success, and lengths, as well as an increase in the number of embryos with severe deformities and diminished eye and body pigmentation, after exposure to the leachates. 2-SH-BTH is the only benzothiazole on DTSC's Candidate Chemicals List (DTSC 2021).

Polycyclic aromatic hydrocarbons (PAHs)

Tire crumb rubber materials contain polycyclic aromatic hydrocarbons (PAHs) (USEPA 2019). In particular, PAHs have been identified as general causes of the deterioration of aquatic ecosystems in recent decades (Baali et al. 2016). PAHs have severe detrimental effects on aquatic life (Behera et al. 2018). PAHs are the most toxic pollutants found in crude oil; however, they come from both natural and anthropogenic sources.

PAHs are ubiquitous environmental pollutants generated primarily during the incomplete combustion of organic materials (e.g., coal, oil, petrol, and wood). These highly persistent organic molecules of high hydrophobicity are extremely toxic to planktons and fishes, hampering their biodiversity in natural aquatic resources (Baali and Yahyaoui 2019, Carls et al. 1999). PAHs-induced harmful effects include growth

reduction, enzymatic disorder, and photosynthesis inhibition in planktons. PAHs and their intermediate degradation products have the potential to generate toxic and mutagenic effects in fish (Brinkmann et al. 2010, Monteiro et al. 2000). Due to hydrophobic nature, PAHs tend to accumulate in the aquatic sediments, leading to bioaccumulation and elevated concentrations over time.

Exposure to PAHs can lead to decreased survival in aquatic organisms during acute exposures. For example, there has been a decrease in survival after early exposure of salmon (*Oncorhynchus gorbuscha*) to dissolve PAHs (Carls et al. 1999). Behera et al. observed that PAHs show moderate to high acute toxicity in aquatic organisms depending upon the type of PAH and the organism involved (2018). Impairment in survival has also been observed in salmon (*Oncorhynchus gorbuscha*) exposed to crude oil (Heintz et al. 1999) and in minnows (*Pimephales promelas*) exposed to contaminated sediment (Colavecchia et al. 2004).

Per- and Polyfluoroalkyl Substances (PFAS)

According to the USEPA, while the amount of PFAS available for exposure through release into the air and biological fluids is relatively low, some PFAS compounds are found in tire rubber (USEPA 2019). Information obtained from the EPA's Safer Chemical Research website indicates that a study pertaining to tire crumb rubber did not identify the PFAS chemical in the non-targeted analyses of tire crumb rubber; however, the study did not specifically test for the presence of any PFAS target analytes and no additional PFAS characterization of rubber or other turf components is planned.

PFAS is a ubiquitous environmental contaminant that can leach into the groundwater or surface water, contaminate drinking water, and stay in the environment for a long time (Evich et al. 2022). Research has focused on the negative health effects of PFAS exposure, but not on the full range of PFAS compounds released into the environment (Lewis et al. 2022). Due to the bioaccumulative behavior, toxicity, and recalcitrance to degradation, PFAS are a focus for many researchers investigating freshwater aquatic ecosystems. Lewis et al. found that PFAS concentration, organic matter, and species present impact bioaccumulation of PFAS strongly in freshwater aquatic ecosystems. Higher trophic level organisms like fish, can be adversely impacted by exposure to PFAS and generally bioaccumulate and biotransform some of these compounds, leading to potential human exposure via fish consumption (Fair et al. 2019).

Like other chemicals (e.g., 6PPD), PFAS may interact with other pollutants or chemicals in the environment, potentially leading to complex degradation pathways. Understanding these factors is essential for assessing the environmental impact of PFAS and developing strategies for its management in aquatic ecosystems. PFAS release to the environment is concerning due to the chemicals' ability to bioaccumulate and the toxic effects on biota.

Chlorinated paraffins (CPs)

Chlorinated paraffins (CPs) are used in various products to improve their physiochemical characteristics (Brandsma et al. 2019). For example, uses of CPs include tire manufacturing and repair, plasticizers, lubricants, flame retardants, and rubber additives. CPs are also found in playground tiles and artificial soccer fields (Brandsma et al. 2019) and coatings for industrial flooring, vessels and swimming pools (e.g., rubber and chlorinated rubber coatings), and as road marking paints (NCBI 1990). CPs are high production volume and persistent chemicals, and their cumulative global production already surpasses that of other persistent anthropogenic chemicals (e.g., PCBs) (Van Mourik et al. 2016). CPs have been detected worldwide, in almost every environmental compartment and in remote areas.

Individual CPs, some of which have also been identified in tire manufacturing, have been shown to be toxic to aquatic species such as invertebrates (USEPA 2015, Sochová et al. 2007, Ren et al. 2018, Zheng et al. 2020). In the Ren et al. study, the developmental toxicity of short-chained CPs to zebrafish embryos/larvae was evaluated, and the metabolomics approach was adopted to explore the impact of short-chained CPs exposure on the metabolism in zebrafish embryos. The study found the survival rate of zebrafish larvae in short-chained CP exposure groups decreased in a concentration-dependent manner. High mortality has been documented in aquatic organisms after exposure to short-chained CPs (Chen et al. 2024). Data on the presence of CPs in the aquatic environment in North America are limited (DTSC 2021). Although data on their bioaccumulation and toxicity are still inconclusive, medium-chained CPs (MCCPs) and long-chained CPs (LCCPs) may also have a bioaccumulation potential (Van Mourik et al. 2016). Considering this and their high production volumes, use, and ubiquitous occurrence in the environment, a better understanding of the levels and fate of all CPs is needed in North America.

DPG (1,3-diphenylguanidine)

DPG is used in the vulcanization process during tire manufacturing. DPG has been detected in the aquatic environment, specifically in roadway runoff and waters affected by urban runoff in California (Du et al. 2020, Overdahl et al. 2021, Johannessen et al. 2021b). A study by Peter et al. (2018) also found DPG in road runoff and surface water in the Seattle, Washington, area, further confirming the presence of DPG in the environment. In addition, DPG has been shown to leach from tires, indicating that tires may be a source of DPG in the aquatic environment.

In a Canadian study, water samples were collected from storm flows into an urban river and analyzed for DPG and 6PPD (Johannessen et al. 2021b). Samples were originally collected in the fall of 2019 and winter of 2020 in the Greater Toronto Area of Canada from the Don River, a highly urbanized watershed in close proximity to several major highways. The Johannessen et al. study concluded DPG and 6PPD were both detected above limits of quantification (i.e., 0.0098 µg/L) in all samples. Further, the

Johannessen et al. study revealed maximum concentrations for 6PPD-quinone of 2.30±0.05 µg/L observed in the river during storm events exceeded the median lethal dose for this compound for coho salmon (i.e.,>0.8 µg/L). There is a growing volume of literature indicating that potentially toxic tire-wear compounds are present at elevated levels and are transported via road runoff into urban surface waters during rain events (Tian et al. 2021, 2022; Johannessen et al. 2021b). Since it is known that DPG persists in the environment, more studies are necessary to conclude whether DPG it toxic to aquatic species and other wildlife.

DPG occurrence is not restricted to the aquatic environment but has been reported in urban air (Johannessen et al. 2022) and drinking water samples (Zhang et al. 2023, Ichihara et al. 2023). DPG is a registered substance under the European Chemicals Agency REACH regulation, where it is classified as toxic to aquatic organisms, with a potential to cause long-term adverse effects in the aquatic environment (DTSC 2021).

Hexamethoxymethylmelamine

Hexamethoxymethylmelamine (HMMM) is a crosslinking agent that is widely used in the production of coatings and plastics, as well as in the manufacturing of tires. As discussed in Section 3.2, *Hazardous Materials*, elevated levels of HMMM in road runoff (stormwater) have been linked with mortality of coho salmon (Peter et al. 2018) and were reported at elevated concentrations during mortality events of the small planktonic crustacean, *Daphnia magna* in the Netherlands and in Germany (Rauert et al. 2020, Dsikowitzky and Schwarzbauer 2015). The two studies from the USEPA on the properties and toxicity of HMMM revealed that HMMM is not readily biodegradable although it is expected to be inherently biodegradable (USEPA 2004, 2007). The acute toxicity for fish, aquatic invertebrates, and aquatic plants is low; however, in vitro tests with mammalian cells showed that the compound has a genotoxic potential (Dsikowitzky and Schwarzbauer 2015). The genetic damage potential of HMMM is not fully understood and Dsikowitzky and Schwarzbauer concluded that synergistic toxic effects in combination with other contaminants are likely.

Zinc

Zinc is critical in tire production (USTMA 2024c); however, zinc also occurs naturally in the soil and is found in numerous products, including galvanized metal, personal care products, batteries, paints and coatings, pharmaceuticals, fertilizer, engine oil, and TWPs (USTMA 2024c). Zinc serves as an activator in the vulcanization process; and tire manufactures use zinc oxide because it contributes to the overall safety of tires as it significantly improves the tire strength, durability, and resistance.

Although zinc naturally occurs in soil, TWPs are a significant source of zinc in the aquatic environment, and aquatic organisms in California's streams, rivers, and lakes may be adversely affected by exposure to high levels of zinc (Hussain et al. 2022). Because of this, the USEPA and the SWRCB have developed water quality criteria that

describe the point at which the amount of zinc in a water system becomes hazardous to aquatic organisms. Zinc bioavailability from sediments is enhanced under conditions of high dissolved oxygen, low salinity low pH, and high levels of inorganic oxides and humic substances (Eisler 1993).

Some research suggests that growth of animal tumors is stimulated by zinc and retarded by zinc deficiency; however, zinc deficiency occurs in many species of plants and animals and has severe adverse effects on all stages of growth, development, reproduction, and survival (Eisler 1993). Zinc poisoning has been documented in dogs, cats, ferrets, birds, cattle, sheep, and horses, usually as a result of ingesting galvanized metal objects, certain paints and fertilizers, zinc-containing coins, and skin and sunblock preparations containing zinc oxide (Wentink et al. 1985, Lu and Combs 1988, Binnerts 1989, Robinette 1990). Signs of acute poisoning include anorexia, depression, enteritis, diarrhea, decreased milk yield, excessive eating and drinking and, in severe cases, convulsions and death (Ogden et al. 1988). Emissions from zinc smelters at Palmerton, Pennsylvania, destroyed wildlife habitat; reduced prey abundance; poisoned deer, songbirds, and shrews; and eliminated terrestrial amphibians from the mountainside at Lehigh Gap (Beyer et al. 1985, Sileo and Beyer 1985). Aquatic populations are frequently decimated in zinc-polluted waters (Solbé and Flook 1975, Everall et al. 1989). Zinc in the aquatic environment is of particular importance because the gills of fish are physically damaged by high concentrations of zinc (NRC 1979). The balance between excess and insufficient zinc in the environment is critical.

Microplastics

As mentioned in Section 3.2, *Hazardous Materials*, tire microplastics from synthetic rubber tires are a major contributor of microplastic pollution to the environment (Mayer et al. 2024, Kole et al. 2017, Sieber et al. 2020, Siegfried et al. 2017, Moran et al. 2021, Sarkar et al. 2023). Microplastics in tires can affect wildlife due to the release of toxic chemicals and tiny particles that can be ingested. Production and use of tires generates multiple heavy metals, plastics, PAHs, and other compounds that can be toxic alone or as chemical cocktails. Tire particles emitted during use are a major component of microplastics in urban runoff and a source of unique and highly potent toxic substances, many of which are currently unknown or poorly described (Mayer et al. 2024).

Microplastic pollution in aquatic environments has been shown to absorb and release harmful chemicals that pose risks to aquatic life (Dong et al. 2020, Yap and Tan 2021, Ma et al. 2019). Additionally, microplastics have been found to transfer these chemicals up the food chain, potentially impacting species across various trophic levels and threatening ecosystem health (Okeke et al. 2022). Microplastics also influence the behavior of aquatic organisms, disrupting their feeding habits and decreasing reproductive success (De-la-Torre et al. 2020, Yardy and Callaghan 2021, Murphy and Quinn 2018, Cole et al. 2019). On land, microplastics have been detected in the digestive systems and feces of various wildlife, such as birds, small mammals, and insects. Ingesting these particles negatively affects their health, including reduced body

condition and altered immune function (Segovia-Mendoza et al. 2020, Liu et al. 2019). Furthermore, microplastics are also present in the atmosphere, and while their effects on wildlife are not yet fully understood, the potential risks are a growing concern (Bergmann et al. 2019, Allen et al. 2019, Trainic et al. 2020).

Gaps remain in our understanding of how TWPs and leachates behave in the environment, their toxicity, and their overall impact. More research is needed to explore the full range of effects caused by tire pollution and to identify viable remediation and risk management approaches.

Adverse Effects, Either Directly or Through Habitat Modifications, on Any Species Identified as a Candidate, Sensitive, or Special Status Species

The proposed RTEP does not involve any direct physical consequences (i.e., new buildings, infrastructure, or land or drainage alterations) that would create changes or disturbances in the environment that would directly affect biological resources. As a result, the RTEP would not result any activities that would remove vegetation, disturb wildlife, or modify natural habitat.

Because improving the energy efficiency of replacement tires does not directly result in any physical changes in the environment, the RTEP would not have any substantial adverse effects, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the CDFW or U.S. Fish and Wildlife Service.

As discussed in Section 3.2.3.2, there could be a project-induced increase in the release of TWP into the environment if the RTEP caused replacement tires to shed TWP more readily than under current conditions. However, because the CEC staff has designed the RTEP regulations to avoid causing replacement tires to shed rubber at a faster rate, on average, than existing replacement tires, the RTEP would not contribute to an increase in the generation of TWP. Therefore, the RTEP would also not contribute to any increase in the release of chemicals contained in TWP that may be harmful to the environment.

One chemical in tire rubber of particular concern is 6PPD, which can transform into 6PPD-Q when introduced into the natural environment. As described above, Tian et al. (2021) found that the primary casual toxicant for decades of stormwater-linked coho salmon acute mortality observations is 6PPD-Q. Although research and findings have raised concerns about 6PPD and its harmful breakdown product, 6PPD-Q (Tian et al. 2021, 2022), the proposed RTEP is not expected to result in an increase in the use of 6PPD in tires because the use of 6PPD does not affect the rolling resistance of tires. 6PPD is used to help keep tire rubber from degrading and does not have a role in reducing rolling resistance. Therefore, tire manufacturers would have no reason to change the amount of 6PPD in tires to conform to the RTEP regulations, resulting in no net change in effects on biological resources from 6PPD. However, the number of tires

being sold in California has been increasing, which could be a source of more 6PPD in the environment in the future, although that is unrelated to the changes in replacement tire characteristics that would be mandated by the RTEP. The effects of 6PPD-Q are discussed in more detail near the beginning of Section 3.4.3.2, above.

Because the RTEP has been designed to avoid an increase in TWPs shed from replacement tires and because increased use of 6PPD is not expected, the CEC staff have concluded that the RTEP will not increase the amount of 6PPD introduced into the environment.

The RTEP does not prescribe tire manufacturers to alter the chemical composition of replacement tires to meet the proposed minimum efficiency standards; however, the composition of tire rubber is expected to continue to evolve as tire manufacturers research ways to improve tire efficiency and other desirable characteristics of tires. It is possible that tire manufacturers will develop modified rubber compounds that help reduce the rolling resistance of replacement tires; however, the exact nature of such changes cannot be accurately predicted and will likely vary among manufacturers.

Adverse Effects on Any Riparian Habitat or Other Sensitive Natural Community Identified in Local or Regional Plans, Policies, and Regulations

The CEC staff do not expect the RTEP to have any direct effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the CDFW or U.S. Fish and Wildlife Service. Implementation of the proposed RTEP regulations would not result in any direct impacts on biological resources because the RTEP is a regulatory program and does not have a physical site location and does involve any type of construction, demolition, or land alteration.

The CEC staff also do not expect indirect impacts on biological resources to be significant. While tires in the environment are known to have some adverse effects on biological resources, they are relatively minor and are not expected to change in any substantial way with the implementation of the RTEP. Studies have shown that tires and the chemicals used in their manufacture are known to have certain adverse consequences for biological resources. As mentioned above, one particular chemical of current concern found in tire rubber is 6PPD, which rapidly emerged as a significant concern due to acute toxicity, the mortality of endangered coho salmon, and the importance of salmon to California Native American Tribes (DTSC 2022).

In riparian habitat and within other sensitive natural communities throughout California, the extent of 6PPD-Q pollution in soils, specifically hydric soils in riparian habitats, remains unclear. Research has suggested that microorganisms in the sediment and water can metabolize 6PPD-Q, contributing to its breakdown (Wei et al. 2024). Therefore, the presence and diversity of microbial communities play a crucial role in the breakdown of chemicals and pollutants in the natural environment. The degradation of 6PPD-Q in aquatic habitats is influenced by several factors including temperature, light

exposure, microbial activity, pH levels of the water, presence of organic matter, sediment composition, flow rate and water movement, and other chemical interactions (Wei et al. 2024). These factors, if present, may cause 6PPD-Q to undergo oxidation and reduction reactions with other chemicals within riparian habitats, such as dissolved oxygen or natural organic matter, which can alter its structure and reduce its toxicity. Water movement can impact the concentration of 6PPD-Q in specific areas, facilitating or hindering microbial access and degradation. 6PPD-Q may interact with other pollutants or chemicals in the environment, potentially leading to complex degradation pathways. Understanding these factors is essential for assessing the environmental impact of 6PPD-Q and developing strategies for its management in aquatic ecosystems. Therefore, it is challenging to conclude what effect 6PPD-Q might have across all riparian habitat communities throughout California without further research conducted to explore this topic.

In addition to 6PPD and 6PPD-Q, the Cao et al. study (2022) found evidence of rubber-derived quinones in water, air, and soil. Specifically, DPPD-quinone (DPPD-Q) and 6PPD-Q were frequently detected (100 percent detection frequency) in runoff water, air particles, and roadside soils, indicating their widespread presence. As mentioned previously, concentrations of 6PPD-Q were detected in air particles, and in runoff water, the detection was greater. DPPD-Q was predominantly found in air particles, while 6PPD-Q was more concentrated in runoff water and roadside soil samples (Cao et al. 2022). These chemicals, and others (e.g., BHT, PAH, etc.) have been identified as general causes of the deterioration of aquatic ecosystems in recent decades (Baali et al. 2016).

Substances like 6PPD and DPPD in tires are introduced into the environment through TWPs. There would be a project-induced increase in the release of TWP into the environment only if the RTEP caused the replacement tires to shed TWP more readily under current conditions. However, the CEC staff has designed the RTEP standards with the intent of avoiding any substantial increase in tread wear that would reduce the average life of replacement tires. If the intent of the standards is realized in this regard, the RTEP would not result in an increase in the shedding of TWPs that can release harmful chemicals into the environment. The RTEP relaxes the RRC MPS for long-life tires to maintain the wear resistance characteristics of such tires. These stipulations help ensure that the RRC standards of the RTEP are not likely to cause replacement tires to wear faster or generate more TWPs, on average, compared to existing replacement tires. Therefore, the CEC staff have concluded that it is unlikely that the RTEP would contribute to an increase in the generation of TWP nor contribute to any increase in the release of chemicals contained in TWP that may be harmful to the environment.

Because the RTEP would not have any physical presence in the environment, the CEC staff have determined that no direct effects on any riparian habitat or other sensitive natural community would occur. Indirect effects on riparian or other sensitive habitats

from possible changes in the use of harmful chemical additives in tire rubber are difficult to characterize because it is not known if any such changes would occur. It is highly unlikely that increased amounts of antioxidants, antidegradants, and antiozonants (e.g., 6PPD) would occur because such chemicals do not play a role in reducing the rolling resistance of tires.

It is possible, unrelated to the RTEP, that new chemical compounds may be included in tire rubber in the future as replacements for known harmful compounds. For example, DTSC has finalized a regulation to list motor vehicle tires containing 6PPD as a new Priority Product. Moreover, DTSC initiated rulemaking on July 11, 2025, to add para-phenylenediamine (PPD) derivatives, which include 6PPD, to its Candidate Chemicals list. These actions which could eventually result in the removal of 6PPD from tires if a suitable replacement can be found. A substitute for the use of 6PPD in tires cannot be predicted at this time.

Overall, the CEC staff do not expect impacts on riparian and other sensitive natural communities to be significant.

Adverse Effects on State or Federally Protected Wetlands

The RTEP is a regulatory program and would not make any direct or indirect changes to the environment; therefore, the RTEP would not have any direct adverse effects on state or federally protected wetlands (including but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means.

Although the contamination of surface waters by chemicals derived from TWPs is an emerging area of research (Kole et al. 2017, Wagner et al. 2018, Baensch-Baltruschat et al. 2020), the RTEP is not expected to result in significant changes in the use of any specific chemical compounds in tire rubber. The RTEP does not require tire manufacturers to alter the chemical composition of replacement tires to meet the proposed minimum efficiency standards; however, the composition of tire rubber is expected to continue to evolve as tire manufacturers search for ways to improve tire efficiency. As described above, it is possible that tire manufacturers will develop modified rubber compounds that help reduce the rolling resistance of replacement tires; however, the exact nature of such changes cannot be accurately predicted and will undoubtedly vary among manufacturers.

As described above, TWPs can introduce harmful chemicals into the environment. The RTEP has been designed to avoid increased shedding of TWPs, on average, compared to existing replacement tires available in California. Further, the CEC staff considers it highly unlikely that increased amounts of certain known chemical additives (e.g., 6PPD) would occur because such chemicals do not play a role in reducing the rolling resistance of tires. Any potential changes in tire rubber formulation that may occur in the future cannot be accurately predicted at this time.

Overall, the CEC staff have concluded that RTEP would not have a substantial adverse effect on state or federally protected wetlands through direct removal, filling, hydrological interruption, or other means. Therefore, impacts would not be significant.

Conclusion

As described above, the CEC staff have concluded that the implementation of the RTEP would not result in any significant impacts on biological resources that can be identified at this time. It is possible that tire manufacturers will develop modified rubber compounds that help reduce the rolling resistance of replacement tires; however, the exact nature of such changes cannot be accurately predicted and will likely vary among manufacturers. The CEC staff designed the RTEP to avoid any significant increase in tread wear that would reduce the average life of replacement tires. If the intent of the standards is realized in this regard, the CEC staff do not expect the RTEP to result in increases of shedding of TWPs that can release harmful chemicals into the environment and potentially have an adverse effect wildlife or habitat. Therefore, impacts on biological resources are expected to be less than significant.

3.4.3.3 Cumulative Impacts

As discussed above, tires contribute to pollution in the form of TWPs that are shed from tire rubber. TWPs contain various chemical compounds, or their TPs, that are harmful to the environment, particularly the aquatic environment. Although the quantities of such chemicals in TWPs are relatively small, the volume of TWPs generated from tire wear is substantial, resulting in the dispersal of significant amounts of harmful substances into the environment.

The RTEP minimum performance standards for rolling resistance have been crafted with the intent of avoiding any significant increase in tread wear. The goal is to increase the energy efficiency of the replacement tires while avoiding a reduction in the average life of the tires. As a result, the CEC staff do not expect the RTEP to result in an increase in the shedding of TWPs. Therefore, an increase in the release of harmful substances in TWPs into the environment that might harm wildlife or degrade habitat is not expected. For this reason, the CEC staff have concluded that the RTEP is not likely to change baseline conditions related to TWPs and the harmful substances they contain. Therefore, the RTEP would not make a considerable contribution to adverse cumulative impacts related to TWPs.

3.5 Environmental Benefits

The RTEP is designed to ensure that replacement tires sold in California are as energy efficient as original equipment tires. A CEC staff analysis of the proposed regulation, *California's Proposed Replacement Tire Efficiency Program* (Blackburn et al. 2026,

Chapters 8-9), analyzes the key environmental benefits of implementing the RTEP, including:

- **GHG Emissions.** The regulations are anticipated to reduce GHG emissions by an estimated 2.0 million metric tons of carbon dioxide equivalent (CO2e) in 2035. This reduction is equivalent to removing 411,830 internal combustion passenger vehicles off the road.
- **Air Quality.** The proposed regulation is expected to significantly improve air quality by reducing the emissions of criteria air pollutants such as oxides of nitrogen (NOx) and fine particulate matter (PM2.5). The estimated potential annual reduction in 2035 is 426 tons of NOx and 10 tons of PM2.5.
- **Criteria Air Pollutants.** In addition to NOx and PM2.5, the regulation will reduce other criteria pollutants associated with fuel combustion (such as SOx and ozone), contributing to overall air quality and public health improvements.
- **Energy Savings.** The regulation is expected to save 3.4 million gallons of diesel, 141.1 million gallons of gasoline, 0.9 terawatt-hours of electricity, and 0.5 million kilograms of hydrogen annually by 2035, contributing to reduced energy consumption and lower emissions from electricity generation.
- **Environmental Justice.** The RTEP will provide benefits for lower-income households, as they spend a higher percentage of their income on transportation fuel. While the regulation will incrementally increase the cost of tires, the fuel savings over the tire's lifespan will result in a net economic benefit, which reduces financial burdens on these households. Additionally, the regulation aims to reduce overall air pollution, which disproportionately affects disadvantaged communities. Improved air quality will contribute to better health outcomes for these communities.

Additional benefits of the proposed regulation include the following:

- **Economic.** The regulations are anticipated to be cost-effective, providing net benefits to consumers over the lifespan of the tires. The proposed regulations are expected to save California drivers $179 (2024 dollars) in fuel costs over the typical four-year life of the tires. In total, the RTEP would save drivers nearly $979 million in fuel costs annually by 2035. The incremental cost of more efficient tires is estimated to be about $26 per set of four lighter vehicle tires, which is offset by the fuel savings over the tire's lifespan.
- **Consumer Equity.** Consumers will have more information on the efficiency of the replacement tire, allowing them to make more informed purchasing decisions.

3.6 References

3.6.1 Utilities and Service Systems: Solid Waste

Blackburn et al. 2026 – Blackburn, Bill, Julie Burbridge, Andrew Hom, Ralph Lee, Ken Rider, David Sakai, Sebastian Serrato, and Rachel Shuen. 2026. *California's Proposed Replacement Tire Efficiency Program*. California Energy Commission. Publication Number: CEC-600-2026-012.

Bolton 2024 – Bolton, Neal. 2024. *Waste Tire Disposal in California*. White Paper. Blue Ridge Services Montana, Inc. September. pp. 1-31.

CalRecycle 2023 – CalRecycle (California Department of Resources Recycling and Recovery). 2023. *Report to the Legislature: Five-Year Plan for the Waste Tire Recycling Management Program*. Publication Number: DRRR-2023-1723. July. pp. 1-68. Available at https://www2.calrecycle.ca.gov/Publications/Details/1723.

_____ 2024. *California Waste Tire Market Report: 2022*. Publication Number: DRRR-2024-1736. May. pp. 1-27. Available at https://www2.calrecycle.ca.gov/Publications/Details/1737.

CEC 2023a – CEC (California Energy Commission). 2023a. *Comments of US Tire Manufacturers Association and Tire and Rubber Association of Canada*. Docket Number: 20-TIRE-01. March 23. pp. 1-46.

Edil 2008 – Edil, Tuncer B. 2008. "A review of environmental impacts and environmental applications of shredded scrap tires." In *Scrap Tire-Derived Geomaterials-Opportunities and Challenges*, Hazarika, H., Yasuhara, K., Eds. Taylor & Francis Group: London, United Kingdom. pp. 147–157. ISBN 978-0-415-46070-5. Available at https://rmrc.wisc.edu/wp-content/uploads/2013/10/A-Review-of-Environmental-Impacts-and-Environmental-Applications-of-Shredded-Scrap-Tires.pdf.

Mayer et al. 2024 – Mayer, Paul, Kelly Moran, Ezra Miller, Susanne Brander, Stacey Harper, Manuel Garcia-Jaramillo, Victor Carrasco-Navarro, Kay Ho, Robert Burgess, Leah Thronton Hampton, Elise Granek, Margaret McCauley, Jenifer McIntyre, Edward Kolodziej, Ximin Hu, Antony Williams, Barbara Beckingham, Miranda Jackson, Rhea Sanders-Smith, Chloe Fender, George King, Michael Bollman, Sujay Kaushal, Brittany Cunningham, Sara Hutton, Jackelyn Lang, Heather Goss, Samreen Siddiqui, Rebecca Sutton, Diana Lin, and Miguel Mendez. 2024. "Where the rubber meets the road: Emerging environmental impacts of tire wear particles and their chemical cocktails." Science of the Total Environment, 927, 171153. Available at https://doi.org/10.1016/j.scitotenv.2024.171153.

Recycled Rubber Coalition 2024 – Recycled Rubber Coalition. 2024. "An Unexpected Electric Vehicle Problem with Common Sense Solutions." Available at https://recycledrubbercoalition.org/s/EV-White-Paper-Final.pdf.

Sellers et al. 2024 – Sellers, Bradley, Bruce Lambillotte, and Joshua Guilliams. 2024. "23-1009841BS Rolling Resistance and Tire Technology." Smithers. December. Prepared for Aspen Environmental Group to support the Environmental Impact Report for the California Replacement Tire Efficiency Program.

Tire Recycling Foundation 2024 – Tire Recycling Foundation. 2024. "Tire Recycling: End-of-Life Tire Collection and Processing." Available at https://tirerecyclingfoundation.org/tire-recycling.

USTMA 2021 – USTMA (United States Tire Manufacturers Association). 2021. "Milepost 2020: Scrap Tires." Sustainability Update. March 21. Available at https://www.ustires.org/sites/default/files/2024-05/Scrap%20Tire%20Vision%20Update.pdf.

_____ 2024a. *2023 End-of-Life Tire Management Report*. October 24. Available at https://www.ustires.org/system/files/2024-10/USTMA%27s%202023%20End-of-Life%20Tire%20Management%20Report.pdf.

3.6.2 Hazardous Materials

Alhelou et al. 2019 – Alhelou, Razan, Bettina Seiwert, and Thorsten Reemtsma. 2019. "Hexamethoxymethylmelamine – A precursor of persistent and mobile contaminants in municipal wastewater and the water cycle." *Water Research*, 165, 114973. Available at https://doi.org/10.1016/j.watres.2019.114973.

Amna et al. 2024 – Amna, Riffat, Hemant Mittal, and Saeed M. Alhassan. 2024. "Sulfur Copolymers Used for the Removal of Heavy Metals from Wastewater." *Reference Module in Materials Science and Materials Engineering*. Available at https://doi.org/10.1016/B978-0-323-95486-0.00013-2.

ATSDR 2023 – ASTDR (Agency for Toxic Substances and Disease Registry). 2023. "Polycyclic aromatic hydrocarbons (PAHs): ToxFAQs." U.S. Department of Health and Human Services. Available at https://www.atsdr.cdc.gov/toxfaqs/tfacts69.pdf.

Beilen and Pourier 2012 – Beilen, Jan B., and Yves Pourier. 2012. "Plants as factories for bioplastics and other novel biomaterials." *Plant Biotechnology and Agriculture*, 481-494. Available at https://doi.org/10.1016/B978-0-12-381466-1.00030-4.

CalRecycle 2023 – CalRecycle (California Department of Resources Recycling and Recovery). 2023. *Report to the Legislature: Five-Year Plan for the Waste Tire Recycling Management Program*. Publication Number: DRRR-2023-1723. July. 1-68. Available at https://www2.calrecycle.ca.gov/Publications/Details/1723.

Castan et al. 2023 – Castan, S., A. Sherman, R. Peng, M.T. Zumstein, W. Wanek, T. Hüffer, and T. Hofmann. 2023. "Uptake, metabolism, and accumulation of Tire Wear particle-derived compounds in lettuce." *Environmental Science & Technology*, 57, 168-178. Available at https://doi.org/10.1021/acs.est.2c05660.

Cataldo 2000 – Cataldo, F. 2000. "Guayule rubber: a new possible world scenario for the production of natural rubber?" *Progress in Rubber Plastics and Recycling Technology*, 16(1), 31-59. Available at https://www.researchgate.net/publication/279905374_Guayule_rubber_a_new_possible_world_scenario_for_the_production_of_natural_rubber.

Cheremisinoff 2001 – Cheremisinoff, Nocholas P. 2001. "Synthetic Rubber." In *Condensed Encyclopedia of Polymer Engineering Terms*, 1st Edition. Boston, Massachusetts: Butterworth-Heinemann. ISBN: 9781849723251. Available at https://doi.org/10.1016/C2009-0-25687-X.

Contec 2024 – Contec Spółka Akcyjna. 2024. "Rubber and Beyond: What are Tires Made of?" Available at https://contec.tech/what-are-tires-made-of/#:~:text=Tires%20are%20made%20of%20several,many%20of%20the%20synthetic%20materials.

Cornish 2001 – Cornish, K. 2001. "Biochemistry of natural rubber, a vital raw material, emphasizing biosynthetic rate, molecular weight and compartmentalization, in evolutionarily divergent plant species." *Natural Product Reports*, 18(2), 182-189. Available at https://doi.org/10.1039/A902191D.

Domínguez et al. 2012 – Domínguez, Joaquín R., T. González, P. Palo, J. Sánchez-Martín, M. A. Rodrigo, and C. Sáez. 2012. "Electrochemical Degradation of a Real Pharmaceutical Effluent." Water, Air, & Soil Pollution, 223, 2685–2694. Available at https://doi.org/10.1007/s11270-011-1059-3.

DTSC 2021 – DTSC (Department of Toxic Substances Control). 2021. "Other Tire-Derived Chemicals of Interest." Summary and Questions for July 2021 DTSC Workshop. Available at https://dtsc.ca.gov/wp-content/uploads/sites/31/2021/06/Other-Tire-Derived-Chemicals-of-Interest-Summary-and-Questions-2021_ADA.pdf.

_____ 2024a. "Adopted Priority Product: Motor Vehicle Tires Containing 6PPD." Safer Consumer Products. Available at https://dtsc.ca.gov/scp/motor_vehicle_tires_containing_6ppd/.

_____ 2024b. "Proposed Priority Product: Motor Vehicle Tires Containing Zinc." Safer Consumer Products. Available at https://dtsc.ca.gov/scp/motor_vehicle_tires_containing_zinc/#:~:text=Once%20TWP%20are%20released%20into,becomes%20hazardous%20to%20aquatic%20organisms.

_____ 2024c. "Safer Consumer Products – Program Overview." Available at https://dtsc.ca.gov/scp/safer-consumer-products-program-overview/.

Glüge et al. 2020 – Glüge, Juliane, Martin Scheringer, Ian T Cousins, Jamie C DeWitt, Gretta Goldenman, Dorte Herzke, Andrew B Lindstrom, Rainer Lohmann, Carla A Ng, Xenia Trier, and Zhanyun Wang. 2021. "An overview of the uses of per- and polyfluoroalkyl substances (PFAS)." *Environmental Science: Processes and Impacts*, 22(12), 2345-2373. Available at https://doi.org/10.1039/d0em00291g.

Gualtieri et al. 2005 – Gualtieri, Maurizio, Laura Rigamonti, Valentina Galeotti, and Marina Camatini. 2005. "Toxicity of tire debris extracts on human lung cell line A549." *Toxicology in Vitro*, 19(7), 1001-1008. Available at https://doi.org/10.1016/j.tiv.2005.06.038.

Hoek et al. 2019 – Hoek, Johannes W. van, Geert Heideman, Jacques W. M. Noordermeer, Wilma K. Dierkes, and Anke Blume. 2019. "Implications of the Use of Silica as Active Filler in Passenger Car Tire Compounds on Their Recycling Options." *Materials*, 12(5), 725. Available at https://doi.org/10.3390/ma12050725.

Hoyer et al. 2022 – Hoyer, Stefan, Lothar Kroll, Kirsten Lippert, and Albrecht Seidel. 2022. "A Long-Term Study on the Content of Polycyclic Aromatic Hydrocarbons in Rubber from End-of-Life Tires of Passenger Cars and Trucks. *Materials*, 15(19), 7017. Available at https://doi.org/10.3390/ma15197017.

ICBA 2024 – ICBA (International Carbon Black Association). 2024. "What is Carbon Black?" Available at https://www.carbon-black.org/new-page-2.

IOCA 2020 – IOCA (International Organization of Motor Vehicle Manufacturers). 2020. "Total World Vehicles in Use." Available at https://www.oica.net/category/vehicles-in-use/.

Jeong et al. 2022 – Jeong, Yoonah, Seolkhwan Lee, and Sang-Hee Woo. 2022. "Chemical Leaching from Tire Wear Particles with Various Treadwear Ratings." *International Journal of Environmental Research and Public Health*, 19(10), 6006. Available at https://doi.org/10.3390/ijerph19106006.

Jiang et al. 2024 – Jiang, Hao, Jing'ai Shao, Qiang Hu, Youjian Zhu, Wei Cheng, Junjie Zhang, Tingting Fan, Jie Y, Haiping Yang, Xiong Zhang, and Hanping Chen. 2024. "Carbon black production characteristics and mechanisms from pyrolysis of rubbers." *Fuel Processing Technology*, 253, 108011. Available at https://www.sciencedirect.com/science/article/pii/S0378382023003594.

Johannessen et al. 2021b – Johannessen, Cassandra, Paul Helm, Brent Lashuk, Viviane Yargeau, and Chris D Metcalfe. 2021. "The Tire Wear Compounds 6PPD-Quinone and 1,3-Diphenylguanidine in an Urban Watershed." *Archives of Environmental Contamination and Toxicology*, 82(2), 171-179. Available at https://doi.org/10.1007/s00244-021-00878-4.

Kole et al. 2017 – Kole, Pieter Jan, Ansje J Löhr, Frank G. A. J. Van Belleghem, and Ad M. J. Ragas. 2017. "Wear and Tear of Tyres: A Stealthy Source of Microplastics

in the Environment." *International Journal of Environmental Research and Public Health*, 14(10), 1265. Available at https://doi.org/10.3390/ijerph14101265.

Lenntech 2024 – Lenntech B.V. 2024. "Chemical properties of zinc - Health effects of zinc - Environmental effects of zinc." Available at https://www.lenntech.com/periodic/elements/zn.htm#:~:text=One%20of%20the%20consequences%20is,slow%20down%20because%20of%20this.&text=Back%20to%20the%20periodic%20table%20of%20elements.

Mattsson et al. 2023 – Mattsson, Karin, Juliana Aristéia de Lima, Tim Wilkinson, Ida Järlskog, Elisabet Ekstrand, Yvonne Andersson Sköld, Mats Gustafsson, and Martin Hassellöv. 2023. "Tyre and road wear particles from source to sea." *Microplastics and Nonplastics*, 3(14). Available at https://doi.org/10.1186/s43591-023-00060-8.

Mayer et al. 2024 – Mayer, Paul, Kelly Moran, Ezra Miller, Susanne Brander, Stacey Harper, Manuel Garcia-Jaramillo, Victor Carrasco-Navarro, Kay Ho, Robert Burgess, Leah Thronton Hampton, Elise Granek, Margaret McCauley, Jenifer McIntyre, Edward Kolodziej, Ximin Hu, Antony Williams, Barbara Beckingham, Miranda Jackson, Rhea Sanders-Smith, Chloe Fender, George King, Michael Bollman, Sujay Kaushal, Brittany Cunningham, Sara Hutton, Jackelyn Lang, Heather Goss, Samreen Siddiqui, Rebecca Sutton, Diana Lin, and Miguel Mendez. 2024. "Where the rubber meets the road: Emerging environmental impacts of tire wear particles and their chemical cocktails." Science of the Total Environment, 927, 171153. Available at https://doi.org/10.1016/j.scitotenv.2024.171153.

Moran et al. 2023 – Moran, Kelly, Alicia Gilbreath, Miguel Méndez, Diana Lin, and Rebecca Sutton. 2023. "Tire Wear: Emissions Estimates and Market Insights to Inform Monitoring Design." San Francisco Estuary Institute. Richmond, California. February. Available at https://www.sfei.org/documents/tire-wear-emissions-estimates-and-market-insights-inform-monitoring-design.

Neethirajan et al. 2022 – Neethirajan, Jeevanandham, Arshad Rahman Parathodika, Guo-Hua Hu, and Kinsuk Naskar. 2022. "Functional rubber composites based on silica-silane reinforcement for green tire application: the state of the art." Functional Composite Mater, 3(7). Available at https://doi.org/10.1186/s42252-022-00035-7.

NIH 2012 – NIH (National Institutes of Health). 2012. "Occupational Exposures in the Rubber-Manufacturing Industry." National Library of Medicine. Available at https://www.ncbi.nlm.nih.gov/books/NBK304412/.

OEHHA 2024a – OEHHA (California Office of Environmental Health Hazard Assessment) 2024a. "Green Chemistry." Available at https://oehha.ca.gov/risk-assessment/green-chemistry.

_____ 2024b. "About Proposition 65." Available at https://oehha.ca.gov/proposition-65/about-proposition-65.

Pavan et al. 2019 – Pavan, Cristina, Massimo Delle Piane, Maria Gullo, Francesca Filippi, Bice Fubini, Peter Hoet, Claire J. Horwell, François Huaux, Dominique Lison, Cristina Lo Giudice, Gianmario Martra, Eliseo Montfort, Roel Schins, Marialore Sulpizi, Karsten Wegner, Michelle Wyart-Remy, Christina Ziemann, and Francesco Turci. 2019. "The puzzling issue of silica toxicity: are silanols bridging the gaps between surface states and pathogenicity?" *Particle and Fibre Toxicology*, 32. Available at https://doi.org/10.1186/s12989-019-0315-3.

Rauert et al. 2020 – Rauert, Cassandra, Sarit L. Kaserzon, Cameron Veal, Ruby Y. Yeh, Jochen F. Mueller, and Kevin V. Thomas. 2020. "The first environmental assessment of hexa(methoxymethyl)melamine and co-occurring cyclic amines in Australian waterways." *Science of The Total Environment*, 743, 140834. Available at https://doi.org/10.1016/j.scitotenv.2020.140834.

Solomon et al. 2018 – Solomon, Gina, and Peggy Reynolds, and Anh Hoang. 2018. *California's Green Chemistry Initiative at Age 10: An Evaluation of Its Progress And Promise.* Public Health Institute. Available at https://www.phi.org/uploads/files/CA%20Green%20Chemistry%20Initiative%20at%20Age%2010-final.pdf.

Statista 2024 – Statista. 2024. "Motor vehicle registrations in the U.S. in 2022, by state." Available at https://www.statista.com/statistics/196505/total-number-of-registered-motor-vehicles-in-the-us-by-state/#:~:text=In%202021%2C%20California%20was%20the,the%20nation's%20most%20populous%20state.

_____. 2025a. "Number of passenger cars and commercial vehicles in use worldwide from 2006 to 2015 in (1,000 units)." Available at https://www.statista.com/statistics/281134/number-of-vehicles-in-use-worldwide/.

_____. 2025b. "Tire manufacturing gross output in the United States from 2012 to 2022(in billion U.S. dollars)." Available at https://www.statista.com/statistics/195334/us-tire-manufacturing-gross-output-since-1998/#:~:text=In%202022%2C%20the%20U.S.%20tire,recorded%20in%20the%20observed%20period.

_____. 2025c. "Shipments of U.S. tires in 2022, by category(in million units)." Available at https://www.statista.com/statistics/275961/production-of-tires-in-the-united-states-by-category/#:~:text=In%202022%2C%20overall%20shipments%20of,with%20some%20222%20million%20units.

Tian et al. 2020 – Tian, Zhenyu et al. 2020. "A ubiquitous tire rubber–derived chemical induces acute mortality in coho salmon." *Science*, 371(6525), 185-189. Available at https://doi.org/10.1126/science.abd6951.

USEPA 2024a – USEPA (U.S. Environmental Protection Agency) 2024a. "6PPD-quinone: What is 6PPD-quinone?" Safer Chemicals Research. Available at https://www.

epa.gov/chemical-research/6ppd-quinone#:~:text=When%20it%20rains%2C%20stormwater%20from,to%20quickly%20kill%20some%20fish.

_____ 2024b. "Chemicals and Materials We Are Researching." Available at https://www.epa.gov/chemical-research/chemicals-and-materials-we-are-researching.

_____ 2024c. "Hexa(methoxymethyl)melamine." CompTox Chemical Dashboard v.2.5.0. Available at https://comptox.epa.gov/dashboard/chemical/details/DTXSID9027520.

_____ 2024d. "Summary of the Toxic Substances Control Act." Available at https://www.epa.gov/laws-regulations/summary-toxic-substances-control-act.

USTMA 2024b – USTMA (U.S. Tire Manufacturers Association). 2024b. "How a Tire is Made." Available at https://www.ustires.org/tires-101/how-tire-made.

Wang et al. 2024 – Wang Yu, Xinao Li, Hao Yang, Yang Wu, Qikun Pu, Wei He, and Xixi Li. 2024. "A review of tire wear particles: Occurrence, adverse effects, and control strategies." *Ecotoxicology and Environmental Safety*, 283, 116782. Available at https://doi.org/10.1016/j.ecoenv.2024.116782.

Xu et al. 2022 – Xu, Jing, Yanfen Hao, Zhiruo Yang, Wenjuan Li, Wenjing Xie, Yani Huang, Deliang Wang, Yuqing He, Yong Liang, Julius Matsiko, and Pu Wang. 2022. "Rubber Antioxidants and Their Transformation Products: Environmental Occurrence and Potential Impact." *International Journal of Environmental Research and Public Health*, 19(21), 14595. Available at https://doi.org/10.3390/ijerph192114595.

Zhao et al. 2023 – Zhao, Wufan, Jing He, Peng Yu, Xueliang Jiang, and Liqun Zhang. 2023. "Recent progress in the rubber antioxidants: A review." *Polymer Degradation and Stability*, 207, 110223. Available at https://doi.org/10.1016/j.polymdegradstab.2022.110223.

3.6.3 Air Quality

Blackburn et al. 2026 – Blackburn, Bill, Julie Burbridge, Andrew Hom, Ralph Lee, Ken Rider, David Sakai, Sebastian Serrato, and Rachel Shuen. 2026. *California's Proposed Replacement Tire Efficiency Program*. California Energy Commission. Publication Number: CEC-600-2026-012.

CARB 2020 – CARB (California Air Resources Board). 2020. "Real-World Tire and Brake-Wear Emissions." Contract Number: 18RD017. Available at https://ww2.arb.ca.gov/real-world-tire-and-brake-wear-emissions.

_____ 2024a. "Characterization of Tire-Wear and Brake-Wear PM Emissions Under On-Road Driving Conditions." Contract Number: 22RD002. Available at https://ww2.arb.ca.gov/characterization-tire-wear-and-brake-wear-pm-emissions-under-road-driving-conditions.

_____ 2024b. "California State Implementation Plans." Available at https://ww2.arb.ca.gov/our-work/programs/california-state-implementation-plans/about.

_____ 2024c. "Criteria Air Pollutant Emissions for User Defined Query." Available at https://ww2.arb.ca.gov/applications/emissions-user-defined-query.

Mayer et al. 2024 – Mayer, Paul, Kelly Moran, Ezra Miller, Susanne Brander, Stacey Harper, Manuel Garcia-Jaramillo, Victor Carrasco-Navarro, Kay Ho, Robert Burgess, Leah Thronton Hampton, Elise Granek, Margaret McCauley, Jenifer McIntyre, Edward Kolodziej, Ximin Hu, Antony Williams, Barbara Beckingham, Miranda Jackson, Rhea Sanders-Smith, Chloe Fender, George King, Michael Bollman, Sujay Kaushal, Brittany Cunningham, Sara Hutton, Jackelyn Lang, Heather Goss, Samreen Siddiqui, Rebecca Sutton, Diana Lin, and Miguel Mendez. 2024. "Where the rubber meets the road: Emerging environmental impacts of tire wear particles and their chemical cocktails." Science of the Total Environment, 927, 171153. Available at https://doi.org/10.1016/j.scitotenv.2024.171153.

USEPA 2016 – USEPA (U.S. Environmental Protection Agency). 2016. "Common Wastes & Materials, Scrap Tires, Tire Fires." Last updated February 22. Available at https://archive.epa.gov/epawaste/conserve/materials/tires/web/html/fires.html.

_____ 2024e. "Where the Rubber Meets the Road: Emerging Environmental Impacts of Tire Wear Particles and Their Chemical Cocktails." August 7. Available at https://www.epa.gov/sciencematters/where-rubber-meets-road-epa-researchers-study-environmental-and-health-impacts-tires.

3.6.4 Biological Resources

Allen et al. 2019 – Allen, S., D. Allen, V.R. Phoenix, G. Le Roux, P. Durántez Jiménez, A. Simonneau, S. Binet, and D. Galop. 2019. "Atmospheric Transport and Deposition of Microplastics in a Remote Mountain Catchment." *Nature Geoscience*, 12, 339–344. Available at https://www.nature.com/articles/s41561-019-0335-5.

Baali et al. 2016 – Baali, A., U. Kammann, R. Hanel, I. El Qoraychy, and A. Yahyaoui. 2016. "Bile metabolites of polycyclic aromatic hydrocarbons (PAHs) in three species of fish from Morocco." *Environmental Sciences Europe*, 28(25). Available at https://doi.org/10.1186/s12302-016-0093-6.

Baali and Yahyaoui 2019 – Baali, A., and A. Yahyaoui. 2019. "Polycyclic Aromatic Hydrocarbons (PAHs) and Their Influence to Some Aquatic Species." In *Biochemical Toxicology – Heavy Metals and Nanomaterials*, Eds. M. Ince, O. Kaplan Ince, G. Ondrasek. Chapter 12. Rijeka, Croation: IntechOpen. ISBN: 978-1-78984-697-3. Available at https://www.intechopen.com/chapters/67269.

Baensch-Baltruschat et al. 2020 – Baensch-Baltruschat, B., B. Kocher, F. Stock, and G. Reifferscheid. 2020. "Tyre and road wear particles (TRWP) - A review of generation, properties, emissions, human health risk, ecotoxicity, and fate in the environment." *Science of the Total Environment*, 733, 137823. Available at https://doi.org/10.1016/j.scitotenv.2020.137823.

Behera et al. 2018 – Behera, B., A. Das, D.J. Sarkar, P. Weerathunge, P.K. Parida, B.K. Das, P. Thavamani, R. Ramanathan, and V. Bansal. 2018. "Polycyclic Aromatic Hydrocarbons (PAHs) in inland aquatic ecosystems: Perils and remedies through biosensors and bioremediation." *Environmental Pollution*, 241, 212-233. Available at https://doi.org/10.1016/j.envpol.2018.05.016.

Bergmann et al. 2019 – Bergmann, M., S. Mützel, S. Primpke, M.B. Tekman, and G. Gerdts. 2019. "White and wonderful? Microplastics prevail in snow from the Alps to the Arctic." *Science Advances*, 5(8). Available at https://doi.org/10.1126/sciadv.aax1157.

Beyer et al. 1985 – Beyer, W.N., O. H. Pattee, L. Sileo, D.J. Hoffman, and B.M. Mulhern. 1985. "Metal contamination in wildlife living near two zinc smelters." *Environmental Pollution* 38(1), 63-86. Available at https://doi.org/10.1016/0143-1471(85)90094-7.

Binnerts, W. 1989 – Binnerts, W.T. 1989. "Zinc status of cows as deduced from the liver zinc content." *Netherlands Journal of Agricultural Science*, 37, 107-117. Available at https://library.wur.nl/ojs/index.php/njas/article/view/16642/16056.

Brandsma et al. 2019 – Brandsma, S. H., M. Brits, Q.R. Groenewoud, M.J.M. van Velzen, P.E.G. Leonards, and J. de Boer. 2019. "Chlorinated paraffins in car tires recycled to rubber granulates and playground tiles." *Environmental Science & Technology*, 53(13), 7595–7603. Available at https://doi.org/10.1021/acs.est.9b01835.

Brinkmann et al. 2010 – Brinkmann, M., S. Hudjetz, C. Cofalla, S. Roger, U. Kammann, J.P. Giesy, M. Hecker, S. Wiseman, X. Zhang, J. Wölz, H. Schüttrumpf, and H. Hollert. 2010. "A combined hydraulic and toxicological approach to assess re-suspended sediments during simulated flood events. Part I-multiple biomarkers in rainbow trout." *Journal of Soils and Sediments*, 10, 1347-1361. Available at https://doi.org/10.1007/s11368-010-0271-x.

Brinkmann et al. 2022 – Brinkmann, M., D. Montgomery, S. Selinger, J.G.P. Miller, E. Stock, A.J. Alcaraz, J.K. Challis, L. Weber, D. Janz, M. Hecker, and S. Wiseman. 2022. "Acute toxicity of the tire rubber-derived chemical 6PPD-quinone to four fishes of commercial, cultural, and ecological importance." *Environmental Science & Technology Letters*, 9, 333–338. Available at https://doi.org/10.1021/acs.estlett.2c00050.

CAL FIRE 2024a – CAL FIRE (California Department of Forestry and Fire Protection). 2024. "The Department of Forestry and Fire Protection." Accessed October 2024. Available at www.fire.ca.gov.

Caltrans 2022 – Caltrans (California Department of Transportation). 2022. *California 2022 Public Road Data*. Released November 2023. Available at https://dot.ca.gov/-/media/dot-media/programs/research-innovation-system-information/documents/hpms2022_prd_final.pdf.

Cao et al. 2022 – Cao, G., W. Wang, J. Zhang, P. Wu, Z. Xingchen, Z. Yang, and D. Hu. 2022. "New Evidence of Rubber-Derived Quinones in Water, Air, and Soil." *Environmental Science & Technology*, 56, 4142-4150. Available at https://doi.org/10.1021/acs.est.1c07376.

Carls et al. 1999 – Carls, M.G., S.D. Rice, and J.E. Hose. "Sensitivity of fish embryos to weathered crude oil: Part I. Low-level exposure during incubation causes malformations, genetic damage, and mortality in larval pacific herring (Clupea pallasi)." *Environmental Toxicology and Chemistry*, 18, 481-493. Available at https://setac.onlinelibrary.wiley.com/doi/epdf/10.1002/etc.5620180317.

CDFW 2002 – CDFW (California Department of Fish and Wildlife). 2002. "Status Review of California Coho Salmon North of San Francisco." Report to California Fish and Game Commission. Candidate Species Status Review Report 1-336. April. Available at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=121350.

CGS 2010 – CGS (California Geological Survey). 2010. "Geologic Map of California." California Department of Conservation. Available at https://www.conservation.ca.gov/cgs/documents/publications/geologic-data-maps/GDM_002-Geologic-Map-of-CA-2010.pdf.

Chen et al. 2024 – Chen, L., J. Hu, A. Borthwick, W. Sun, H. Zhang, D. Jia, and W. Liu. 2024. "Solar-Light-Activated Periodate for Degradation and Detoxification of Highly Toxic 6PPD-Quinone at Environmental Levels." *Nature Water*, 2, 453–463. Available at https://doi.org/10.1038/s44221-024-00236-3.

Chibwe et al. 2022 – Chibwe. L., J.L. Parrott, K. Shires, H. Khan, S. Clarence, C. Lavalle, C. Sullivan, A.M. O'Brien, A.O. De Silva, D.C.G. Muir, and C.M. Rochman. "A Deep Dive into the Complex Chemical Mixture and Toxicity of Tire Wear Particle Leachate in Fathead Minnow." *Environmental Toxicology and Chemistry*, 41(5), 1144-1153. Available at https://doi.org/10.1002/etc.5140.

Chow et al. 2019 – Chow, M.I., J.I. Lundin, C.J. Mitchell, J.W. Davis, G. Young, N.L. Scholz, and J.K. McIntyre. 2019. "An urban stormwater runoff mortality syndrome in juvenile coho salmon." *Aquatic Toxicology*, 214, 105231. Available at https://repository.library.noaa.gov/view/noaa/62544.

CNDDB 2024a – CNDDB (California Natural Diversity Database). 2024a. "State and Federally Listed Endangered and Threatened Animals of California." California

Department of Fish and Wildlife. Sacramento, CA. Accessed October 2024. Available at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109405&inline.

_____ 2024b. "State and Federally Listed Endangered, Threatened, and Rare Plants of California." California Department of Fish and Wildlife. Sacramento, CA. Accessed October 2024. Available at https://nrm.dfg.ca.gov/FileHandler.ashx?DocumentID=109390&inline.

Colavecchia et al. 2004 – Colavecchia, M.V., S.M. Backus, P.V. Hodson, and J.L Parrott. 2004. "Toxicity of oil sands to early life stages of fathead minnows (Pimephales promelas)." *Environmental Toxicology and Chemistry*, 23, 1709-1718. Available at https://pubmed.ncbi.nlm.nih.gov/15230323/.

Cole et al. 2019 – Cole, M., R. Coppock, P.K. Lindeque, D. Altin, S. Reed, D.W. Pond, L. Sørensen, T.S. Galloway, and A.M. Booth. 2019. "Effects of Nylon Microplastic on Feeding, Lipid Accumulation, and Moulting in a Coldwater Copepod." *Environmental Science & Technology*, 53, 7075–7082. Available at https://pubs.acs.org/doi/10.1021/acs.est.9b01853.

De-la-Torre et al. 2020 – De-la-Torre, G.E., D.M. Apaza-Vargas, and L. Santillán. 2020. "Microplastic Ingestion and Feeding Ecology in Three Intertidal Mollusk Species from Lima, Peru." *Revista de Biología Marina y Oceanografía*, 55(2), 167–171. Available at https://revistas.uv.cl/index.php/rbmo/article/view/2502/2536.

Di et al. 2022 – Di, S., Z. Liu, H. Zhao, Y. Li, P. Qi, Z. Wang, H. Xu, Y. Jin, and X. Wang. 2022. "Chiral perspective evaluations: Enantioselective hydrolysis of 6PPD and 6PPD-quinone in water and enantioselective toxicity to *Gobiocypris rarus* and *Oncorhynchus mykiss*." *Environment International*, 166, 107374. Available at https://doi.org/10.1016/j.envint.2022.107374.

Dong et al. 2020 – Dong, Y., M. Gao, Z. Song, and W. Qiu. 2020. "As(III) Adsorption onto Different-Sized Polystyrene Microplastic Particles and Its Mechanism." *Chemosphere*, 239, 124792. Available at https://doi.org/10.1016/j.chemosphere.2019.124792.

Dsikowitzky and Schwarzbauer 2015 – Dsikowitzky, L., and J. Schwarzbauer. 2015. "Hexa(methoxymethyl) melamine: An Emerging Contaminant in German Rivers." *Water Environment Research*, 87(5), 461-469. Available at https://www.jstor.org/stable/24585992.

DTSC 2021 – DTSC (California Department of Toxic Substances Control). 2021. "Other Tire-Derived Chemicals of Interest." Summary and Questions for July 2021 DTSC Workshop. Available at https://dtsc.ca.gov/wp-content/uploads/sites/31/2021/06/Other-Tire-Derived-Chemicals-of-Interest-Summary-and-Questions-2021_ADA.pdf.

_____ 2022. *Product – Chemical Profile for Motor Vehicle Tires Containing N-(1,3 Dimethylbutyl)-N′-phenyl-p-phenylenediamine (6PPD)* (Final Version). 1-102. March 2022. Available at https://dtsc.ca.gov/wp-content/uploads/sites/31/2022/05/6PPD-in-Tires-Priority-Product-Profile_FINAL-VERSION_accessible.pdf.

Du et al. 2020 – Du, B., Z. Tian, K.T. Peter, E. Kolodziej, and C. Wong. 2020. "Developing Unique Nontarget High-Resolution Mass Spectrometry Signatures to Track Contaminant Sources in Urban Waters." *Environmental Science & Technology Letters*, 7(12), 923–930. Available at https://doi.org/10.1021/acs.estlett.0c00749.

Eisler 1993 – Eisler, Ronald. 1993. *Zinc Hazards to Fish, Wildlife, and Invertebrates: A Synoptic Review*. U.S. Department of the Interior, Fish and Wildlife Service, Patuxent Wildlife Research Center. Contaminant Hazard Review, Report 26, April 1993. Available at https://sjrda.stuchalk.domains.unf.edu/files/content/sjrda_188.pdf.

eReferenceDesk 2024 – eReferenceDesk. 2024. "California Geography." Available at https://web.archive.org/web/20241206183309/https://www.ereferencedesk.com/resources/state-geography/california.html.

Everall et al. 1989 – Everall, N.C., N.A.A. Macfarlane, and R.W. Sedgwick. 1989. "The interactions of water hardness and pH with the acute toxicity of zinc to the brown trout, Salmo trutta L." *Journal of Fish Biology*, 35, 27-36. Available at https://irep.ntu.ac.uk/id/eprint/43244/1/10290268.pdf.

Evich et al. 2022 – Evich, Marina G., M.J.B. Davis, J.P. McCord, B. Acrey, J.A. Awkerman, D.R.U. Knappe, A.B. Lindstrom, T.F. Speth, C. Tebes-Stevens, M.J. Strynar, Z. Wang, E.J. Weber, W.M. Henderson, and J.W. Washington. "Per- and polyfluoroalkyl substances in the environment." *Science,* 375(6580). Available at https://www.science.org/doi/10.1126/science.abg9065.

Fair et al. 2019 – Fair, P.A., B. Wolf, N.D. White, S.A. Arnott, K. Kannan, R. Karthikraj, and J.E. Vena. 2019. "Perfluoroalkyl substances (PFAS) in edible fish species from Charleston Harbor and tributaries, South Carolina, United States: Exposure and risk assessment." *Environmental Research*, 171, 266-277. Available at https://doi.org/10.1016/j.envres.2019.01.021.

Fang et al. 2024 – Fang, C., Y. Yu, S. Di, X. Wang, and Y. Jin. 2024. "Untargeted metabolomic analysis reveals a time-course hepatic metabolism disorder induced by short-term 6PPD exposure in rats." *Science of The Total Environment*, 955, 177071. Available at https://doi.org/10.1016/j.scitotenv.2024.177071.

French et al. 2022 – French, B.F., D.H. Baldwin, J. Cameron, J. Prat, K. King, J.W. Davis, J.K. McIntyre, and N.L. Scholz. 2022. "Urban roadway runoff is lethal to juvenile coho, steelhead, and Chinook salmonids, but not congeneric sockeye."

Environmental Science & Technology Letters, 9(9), 733–738. Available at https://doi.org/10.1021/acs.estlett.2c00467.

Gradient 2024 – Gradient. 2024. *Preliminary (Stage 1) Alternatives Analysis Report Motor Vehicle Tires Containing N-(1,3-dimethylbutyl)-N′-phenyl-p-phenylenediamine (6PPD).* Prepared for the U.S. Tire Manufacturers Association (USTMA). July 17, 2024. Available at https://www.ustires.org/system/files/files/2024-08/USTMA%206PPD%20Consortium%20Revised%20Preliminary%20AA%20Report_July_2024.pdf.

Greer et al. 2023a – Greer, J.B., E.M. Dalsky, R.F. Lane, and J.D. Hansen. 2023a. "Establishing an in vitro model to assess the toxicity of 6PPD-quinone and other tire wear transition products." *Environmental Science & Technology Letters*, 10(6), 533-537. Available at https://doi.org/10.1021/acs.estlett.3c00196.

Greer et al. 2023b – Greer, J.B., E.M. Dalsky, R.F. Lane, and J.D. Hansen. 2023b. "Tire-Derived Transformation Product 6PPD-Quinone Induces Mortality and Transcriptionally Disrupts Vascular Permeability Pathways in Developing Coho Salmon." *Environmental Science & Technology*, 57(30), 10940-10950. Available at https://doi.org/10.1021/acs.est.3c01040.

Heintz et al. 1999 – Heintz, R.A., J.W. Short, and S.D. Rice. 1999. "Sensitivity of fish embryos to weathered crude oil: Part II. Increased mortality of pink salmon (Oncorhynchus gorbuscha) embryos incubating downstream from weathered Exxon valdez crude oil." *Environmental Toxicology and Chemistry*, 18(3), 494-503. Available at https://doi.org/10.1002/etc.5620180318.

Hiki et al. 2021 – Hiki, K., K. Asahina, K. Kato, T. Yamagishi, R. Omagari, Y. Iwasaki, H. Watanabe, and H. Yamamoto. 2021. "Acute toxicity of a tire rubber-derived chemical, 6PPD quinone, to freshwater fish and crustacean species." *Environmental Science & Technology Letters*, 8(9), 779–784. Available at https://doi.org/10.1021/acs.estlett.1c00453.

Hiki and Yamamoto 2022 – Hiki, K., and H. Yamamoto. 2022. "The Tire-Derived Chemical 6PPD-quinone Is Lethally Toxic to the White-Spotted Char Salvelinus leucomaenis pluvius but Not to Two Other Salmonid Species." *Environmental Science & Technology Letters*, 9(12), 1050-1055. Available at https://doi.org/10.1021/acs.estlett.2c00683.

Hu et al. 2023 – Hu, X, H. Zhao, Z. Tian, K.T. Peter, M.C. Dodd, and E.P. Kolodziej. 2023. "Chemical Characteristics, Leaching, and Stability of the Ubiquitous Tire Rubber-Derived Toxicant 6PPD-Quinone." *Environmental Science: Process and Impacts*, 5. Available at https://doi.org/10.1039/D3EM00047H.

Hussain et al. 2022 – Hussain, S., M. Khan, T.M.M Sheikh, M.Z. Mumtaz, T.A. Chohan, S. Shamim, and Y. Liu. 2022. "Zinc Essentiality, Toxicity, and Its Bacterial

Bioremediation: A Comprehensive Insight." *Frontiers in Microbiology*, 13. Available at https://doi.org/10.3389/fmicb.2022.900740.

Ichihara et al. 2023 – Ichihara, M., D. Asakawa, A. Yamamoto, and M. Sudo. 2023. "Quantitation of guanidine derivatives as representative persistent and mobile organic compounds in water: method development." *Analytical and Bioanalytical Chemistry*, 415(10), 1953–1965. Available at https://doi.org/10.1007/s00216-023-04613-x.

Johannessen et al. 2021a – Johannessen, C., P. Helm, and C.D. Metcalfe. 2021a. "Detection of selected tire wear compounds in urban receiving waters." *Environmental Pollution*, 287, 117659. Available at https://doi.org/10.1016/j.envpol.2021.117659.

Johannessen et al. 2021b – Johannessen, Cassandra, Paul Helm, Brent Lashuk, Viviane Yargeau, and Chris D Metcalfe. 2021. "The Tire Wear Compounds 6PPD-Quinone and 1,3-Diphenylguanidine in an Urban Watershed." *Archives of Environmental Contamination and Toxicology*, 82(2), 171-179. Available at https://doi.org/10.1007/s00244-021-00878-4.

Johannessen et al. 2022 – Johannessen, C., A. Saini, X. Zhang, and T. Harner. 2022. "Air monitoring of tire-derived chemicals in global megacities using passive samplers." *Environmental Pollution*, 314, 120206. Available at https://doi.org/10.1016/j.envpol.2022.120206.

Katz 2010 – Katz, Josh. 2010. "Steelhead Trout of the American River." American River Conservancy. Available at www.arconservancy.org/steelhead-trout-american-river. (Link no longer active).

Kole et al. 2017 – Kole, Pieter Jan, Ansje J Löhr, Frank G. A. J. Van Belleghem, and Ad M. J. Ragas. 2017. "Wear and Tear of Tyres: A Stealthy Source of Microplastics in the Environment." *International Journal of Environmental Research and Public Health*, 14(10), 1265. Available at https://doi.org/10.3390/ijerph14101265.

Lewis et al. 2022 – Lewis, A.J., X. Yun, D.E. Spooner, M.J. Kurz, E.R. McKenzie, and C.M. Sales. 2022. "Exposure pathways and bioaccumulation of per- and polyfluoroalkyl substances in freshwater aquatic ecosystems: Key considerations." *Science of The Total Environment*, 822, 153561. Available at https://doi.org/10.1016/j.scitotenv.2022.153561.

Liu et al. 2019 – Liu, Z., P. Yu, M. Cai, D. Wu, M. Zhang, M. Chen, and Y. Zhao. 2019. "Effects of Microplastics on the Innate Immunity and Intestinal Microflora of Juvenile Eriocheir Sinensis." *Science of the Total Environment*, 685, 836–846. Available at https://doi.org/10.1016/j.scitotenv.2019.06.265.

Lo et al. 2023 – Lo, B.P., V.L. Marlatt, X. Liao, S. Reger, C. Gallilee, A.R.S. Ross, and T.M. Brown. 2023. "Acute Toxicity of 6PPD-Quinone to Early Life Stage Juvenile Chinook (Oncorhynchus tshawytscha) and Coho (Oncorhynchus kisutch)

Salmon." *Environmental Toxicology and Chemistry*, 42(4), 815-822. Available at https://doi.org/10.1002/etc.5568.

Lu and Combs 1988 – Lu, J., and G.E. Combs. 1988a. "Effects of excess dietary zinc on pancreatic exocrine function in the chick." *Journal of Nutrition*, 118, 681-689. Available at https://jn.nutrition.org/article/S0022-3166(22)16934-8/abstract.

Ma et al. 2019 – Ma, J., J. Zhao, Z. Zhu, L. Li, and F. Yu. 2019. "Effect of Microplastic Size on the Adsorption Behavior and Mechanism of Triclosan on Polyvinyl Chloride." *Environmental Pollution*, 254, 113104. Available at https://doi.org/10.1016/j.envpol.2019.113104.

Mayer et al. 2024 – Mayer, Paul, Kelly Moran, Ezra Miller, Susanne Brander, Stacey Harper, Manuel Garcia-Jaramillo, Victor Carrasco-Navarro, Kay Ho, Robert Burgess, Leah Thronton Hampton, Elise Granek, Margaret McCauley, Jenifer McIntyre, Edward Kolodziej, Ximin Hu, Antony Williams, Barbara Beckingham, Miranda Jackson, Rhea Sanders-Smith, Chloe Fender, George King, Michael Bollman, Sujay Kaushal, Brittany Cunningham, Sara Hutton, Jackelyn Lang, Heather Goss, Samreen Siddiqui, Rebecca Sutton, Diana Lin, and Miguel Mendez. 2024. "Where the rubber meets the road: Emerging environmental impacts of tire wear particles and their chemical cocktails." Science of the Total Environment, 927, 171153. Available at https://doi.org/10.1016/j.scitotenv.2024.171153.

McIntyre et al. 2021 – McIntyre, J.K., J. Prat, J. Cameron, J. Wetzel, E. Mudrock, K.T. Peter, Z. Tian, C. Mackenzie, J. Lundin, J.D. Stark, K. King, J.W. Davis, E.P. Kolodziej, and N.L. Sholz. 2021. "Treading Water: Tire Wear Particle Leachate Recreates an Urban Runoff Mortality Syndrome in Coho but Not Chum Salmon." *Environmental Science and Technology*, 55(17), 11767-11774. Available at https://doi.org/10.1021/acs.est.1c03569.

Monteiro et al. 2000 – Monteiro, P.R.R., M.A. Reis-Henriques, and J. Coimbra. 2000. "Plasma steroid levels in female flounder (Platichthys flesus) after chronic dietary exposure to single polycyclic aromatic hydrocarbons." *Marine Environmental Research*, 49, 453-467. Available at https://doi.org/10.1016/s0141-1136(99)00085-9.

Moran et al. 2021 – Moran, K., E. Miller, M. Mendez, S. Moore, A. Gilbreath, R. Sutton, and D. Lin. 2021. *A Synthesis of Microplastic Sources and Pathways to Urban Runoff (No. SFEI Contribution No. 1049).* San Francisco Estuary Institute: Richmond, California, USA. Available at https://www.sfei.org/documents/synthesis-microplastic-sources-and-pathways-urban-runoff.

Muir 1894 – Muir, John. 1894. *The Mountains of California*. New York, New York: The Century Company. Available at https://archive.org/details/mountainsofcalif01muir.

Müller et al. 2021 – Müller, K., D. Hübner, S. Huppertsberg, T.P. Knepper, and D. Zahn. 2021. "Probing the chemical complexity of tires: identification of potential tire-borne water contaminants with high-resolution mass spectrometry." *Science of the Total Environment*, 802, 149799. Available at https://doi.org/10.1016/j.scitotenv.2021.149799.

Murphy and Quinn 2018 – Murphy, F., and B. Quinn. 2018. "The Effects of Microplastic on Freshwater Hydra Attenuata Feeding, Morphology & Reproduction." *Environmental Pollution*, 234, 487–494. Available at https://doi.org/10.1016/j.envpol.2017.11.029.

NCBI 1990 – NCBI (National Center for Biotechnology Information). 1990. *Some Flame Retardants and Textile Chemicals, and Exposures in the Textile Manufacturing Industry.* IARC Monographs on the Evaluation of Carcinogenic Risks to Humans, No. 48. National Library of Medicine, IARC Working Group on the Evaluation of Carcinogenic Risks to Humans. International Agency for Research on Cancer: Lyon, France. ISBN: 978-92-832-1248-5. Available at https://www.ncbi.nlm.nih.gov/books/NBK519196/

NMFS 2019 – NMFS (National Marine Fisheries Service). 2019. "Biological Opinion on the Long-Term Operations of the Central Valley Project and State Water Project." Available at www.westcoast.fisheries.noaa.gov/publications/Central_Valley_Biological_Opinion.pdf.

NOAA 2021 – NOAA (National Oceanic and Atmospheric Administration). 2021. "Central California Coast coho Salmon (*O. Kisutch*). Species in the Spotlight, Priority Actions 2021-2025." NOAA Fisheries. Available at https://media.fisheries.noaa.gov/2021-04/SIS%20Action%20Plan%202021_CCCCoho_FINAL%20508.pdf.

NRC 1979 – NRC (National Research Council). 1979. "Zinc." Subcommittee on Zinc, Committee on Medical and Biologic Effects of Environmental Pollutants, Assembly of Life Sciences, National Research Council. Baltimore: University Park Press. 1-471. ISBN 0839101287. Available at https://catalog.nlm.nih.gov/discovery/fulldisplay?docid=alma995021413406676&context=L&vid=01NLM_INST:01NLM_INST&lang=en&adaptor=Local%20Search%20Engine&tab=LibraryCatalog&query=lds56,contains,Zinc,AND&mode=advanced&offset=0.

Ogden et al. 1988 – Ogden, L., W.C. Edwards, and N.A. Nail. 1988. "Zinc intoxication in a dog from the ingestion of copper clad zinc pennies." *Veterinary and Human Toxicology*, 30(6), 577-578. Available at https://europepmc.org/article/MED/3245125.

Okeke et al. 2022 – Okeke, E.S., C.O. Okoye, E.O. Atakpa, R.E. Ita, R. Nyaruaba, C.L. Mgbechidinma, and O.D. Akan. 2022. "Microplastics in Agroecosystems Impacts on Ecosystem Functions and Food Chain." *Resources, Conservation and*

Recycling, 177, 105961. Available at https://doi.org/10.1016/j.resconrec.2021.105961.

Overdahl et al. 2021 – Overdahl, K.E., R. Sutton, J. Sun, N. DeStefano, G.J. Getzinger, and P.L. Ferguson. 2021. "Assessment of emerging polar organic pollutants linked to contaminant pathways within an urban estuary using non-targeted analysis." *Environmental Science: Processes & Impacts*, 3. Available at https://doi.org/10.1039/D0EM00463D.

Peter et al. 2018 – Peter, K.T., Z. Tian, C. Wu, P. Lin, S. White, B. Du, J.K. McIntyre, N.L. Scholz, and E.P. Kolodziej. 2018. "Using high-resolution mass spectrometry to identify organic contaminants linked to urban stormwater mortality syndrome in coho salmon." *Environmental Science & Technology*, 52(18), 10513-10522. Available at https://doi.org/10.1021/acs.est.8b03175

Quiñones and Moyle 2015 -- Quiñones R.M., and P.B. Moyle. 2015. "California's freshwater fishes: status and management." *Fishes in Mediterranean Environments*, 2015.001, 1-20. Available at https://fishmedjournal.sibic.org/10.29094/FiSHMED.2015.001.pdf.

Rauert et al. 2020 – Rauert, Cassandra, Sarit L. Kaserzon, Cameron Veal, Ruby Y. Yeh, Jochen F. Mueller, and Kevin V. Thomas. 2020. "The first environmental assessment of hexa(methoxymethyl)melamine and co-occurring cyclic amines in Australian waterways." *Science of The Total Environment*, 743, 140834. Available at https://doi.org/10.1016/j.scitotenv.2020.140834.

Ren et al. 2018 – Ren, X., H. Zhang, N. Geng, L. Xing, Y. Zhao, F. Wang, and J. Chen. 2018. "Developmental and metabolic responses of zebrafish (Danio rerio) embryos and larvae to short-chain chlorinated paraffins (SCCPs) exposure." *The Science of the Total Environment*, 622–623, 214–221. Available at https://doi.org/10.1016/j.scitotenv.2017.11.304.

Robinette 1990 – Robinette, C.L. 1990. "Zinc." *Veterinary Clinics of North America Small Animal Practice*, 20, 539-544. Available at https://doi.org/10.1016/S0195-5616(90)50044-3.

Rossomme E et al. 2023 – Rossomme, E., W.M. Hart-Cooper, W.J. Orts, C.M. McMahan, and M. Head-Gordon. 2023. "Computational Studies of Rubber Ozonation Explain the Effectiveness of 6PPD as an Antidegradant and the Mechanism of Its Quinone Formation." *Environmental Science & Technology*, 57(13), 5216-5230. Available at https://doi.org/10.1021/acs.est.2c08717.

RRWA 2021 – RRWA (Russian River Watershed Association). 2021. "Russian River Fish Species." Available at www.rrwatershed.org.

Sarkar et al. 2023 – Sarkar, S., H. Diab, and J. Thompson. 2023. "Microplastic Pollution: Chemical Characterization and Impact on Wildlife." *International Journal of*

Environmental Research Public Health, 20(3), 1745. Available at https://doi.org/10.3390/ijerph20031745.

Sawyer et al. 2009 – Sawyer, J.O., T. Keeler-Wolf, and J.M. Evans. 2009. *Manual of California Vegetation*, 2nd ed. California Native Plant Society: Sacramento, California. 1-1300. Available at https://www.cnps.org/vegetation/manual-of-california-vegetation.

Scholz et al. 2011 – Scholz, N.L., M.S. Meyers, S.G. McCarthy, J.S. Labenia, J.K. McIntyre, G.M. Ylitalo, L.D. Rhodes, C.A. Laetz, C.M. Stehr, B.L. French, B. McMillan, D. Wilson, L. Reed, K.D. Lynch, S. Damm, J.W. Davis, and T.K. Collier. 2011. "Recurrent die-offs of adult coho salmon returning to spawn in Puget Sound lowland urban streams." *PLoS ONE*, 6(12), e28013. Available at https://doi.org/10.1371/journal.pone.0028013.

Segovia-Mendoza et al. 2020 – Segovia-Mendoza, M., K.E. Nava-Castro, M.I. Palacios-Arreola, C. Garay-Canales, and J. Morales-Montor. 2020. "How Microplastic Components Influence the Immune System and Impact on Children Health: Focus on Cancer." *Birth Defects Research*, 112(17), 1341-1361. Available at https://onlinelibrary.wiley.com/doi/10.1002/bdr2.1779.

Seiwert et al. 2020 – Seiwert, B., P. Klöckner, S. Wagner, and T. Reemtsma. 2020. "Source-related smart suspect screening in the aqueous environment: search for tire-derived persistent and mobile trace organic contaminants in surface waters." *Analytical and Bioanalytical Chemistry*, 412(20), 4909-4919. Available at https://doi.org/10.1007/s00216-020-02653-1.

Seiwert et al. 2022 – Seiwert, B., M. Nihemaiti, M. Troussier, S. Weyrauch, and T. Reemtsma. 2022. "Abiotic Oxidative Transformation of 6-PPD and 6-PPD Quinone from Tires and Occurrence of Their Products in Snow from Urban Roads and in Municipal Wastewater." *Water Research*, 212, 118122. Available at https://doi.org/10.1016/j.watres.2022.118122.

Sellers et al. 2024 – Sellers, Bradley, Bruce Lambillotte, and Joshua Guilliams. 2024. "23-1009841BS Rolling Resistance and Tire Technology." Smithers. December. Prepared for Aspen Environmental Group to support the Environmental Impact Report for the California Replacement Tire Efficiency Program.

Sieber et al. 2020 – Sieber, R., D. Kawecki, and B. Nowack. 2020. "Dynamic probabilistic material flow analysis of rubber release from tires into the environment." *Environmental Pollution*, 258, 113573. Available at https://doi.org/10.1016/j.envpol.2019.113573.

Siegfried et al. 2017 – Siegfried, M., A.A. Koelmans, E. Besseling, and C. Kroeze. 2017. "Export of microplastics from land to sea. A modelling approach." *Water Research*, 127, 249–257. Available at https://doi.org/10.1016/j.watres.2017.10.011.

Sileo and Beyer 1985 – Sileo, L., and W. N. Beyer. 1985. "Heavy metals in white-tailed deer living near a zinc smelter in Pennsylvania." *Journal of Wildlife Diseases*, 21, 289-296. Available at https://doi.org/10.7589/0090-3558-21.3.289.

Sochová et al. 2007 – Sochová, I., J. Hofman, I. and Holoubek. 2007. "Effects of seven organic pollutants on soil nematode Caenorhabditis elegans." *Environment International*, 33(6), 798–804. Available at https://doi.org/10.1016/j.envint.2007.03.001.

Solbé and Flook 1975 – Solbe, J.F. De L.G., and V.A. Flook. 1975. "Studies on the toxicity of zinc sulphate and of cadmium sulphate to stone loach *Noemacheilus barbatulus* (L) in hard water." *Journal of Fish Biology*, 7(5), 631-637. Available at https://doi.org/10.1111/j.1095-8649.1975.tb04636.x.

Tian et al. 2021 – Tian, Z., H. Zhao, K.T. Peter, M. Gonzalez, J. Wetzel, C. Wu, X. Hu, J. Prat, E. Mudrock, R. Hettinger, and et al. 2021. "A ubiquitous tire rubber-derived chemical induces acute mortality in coho salmon." *Science*, 371(6525), 185−189. Available at https://doi.org/10.1126/science.abd6951.

Tian et al. 2022 – Tian, Z., M. Gonzalez, C.A. Rideout, H.N. Zhao, X. Hu, J. Wetzel, E. Mudrock, C.A. James, J.K. McIntyre, and E.P. Kolodziej. 2022. "6PPD-Quinone: Revised Toxicity Assessment and Quantification with a Commercial Standard." *Environmental Science & Technology Letters*, 9(2), 128-134. Available at https://doi.org/10.1021/acs.estlett.1c00910.

Trainic et al. 2020 – Trainic, M., J.M. Flores, I. Pinkas, M.L. Pedrotti, F. Lombard, G. Bourdin, G. Gorsky, E. Boss, Y. Rudich, A. Vardi, and I. Koren. 2020. "Airborne Microplastic Particles Detected in the Remote Marine Atmosphere." *Communications Earth & Environment*, 1, 64. Available at https://doi.org/10.1038/s43247-020-00061-y.

Unice et al. 2015 – Unice, K.M., J.L. Bare, M.L. Kreider, and J.M. Panko. 2015. "Experimental methodology for assessing the environmental fate of organic chemicals in polymer matrices using column leaching studies and OECD 308 water/sediment systems: Application to tire and road wear particles." *Science of The Total Environment*, 533, 476-487. Available at https://doi.org/10.1016/j.scitotenv.2015.06.053.

USDA 2024 – USDA (U.S. Department of Agriculture, Forest Service). 2024. "Fire Management and History in California." USDA Forest Service. Available at www.fs.usda.gov.

USEPA 2004 – USEPA (U.S. Environmental Protection Agency). 2004. *Final Submission for Hexamethoxymethylmelamine*. Document 201-15310A. May 28. Available at https://web.archive.org/web/20080521190526/http://www.epa.gov/hpv/pubs/summaries/melhxmth/c14039rt1.pdf.

_____ 2007. *Screening-Level Hazard Characterization of High Production Volume Chemicals: Hexakis(methoxymethyl)-melamine (CAS No. 3089-11-0).* Available at http://www.epa.gov/hpvis/hazchar/3809110_Hexakis%28methoxymethyl%29melamine_HC_INTERIM_December%202007.pdf.

_____ 2015. *TSCA new chemicals review program standard review risk assessment of medium-chain chlorinated paraffins (PMN P-12-0282, P-12-0283) and long-chain chlorinated paraffins (PMN P-12-0284).* Available at https://www.epa.gov/sites/default/files/2015-12/documents/dover_-_standard_review_risk_assessment_p-12-0282-0284_docket_0.pdf.

_____ 2019. "Public Webinar: Part 1 – Tire Crumb Rubber Characterization." EPA and CDC/ASTDR hosted a joint informational webinar on the Synthetic Turf Field Recycled Tire Crumb Rubber Research Under the Federal Research Action Plan (FRAP). Available at https://www.epa.gov/chemical-research/public-webinar-part-1-tire-crumb-rubber-characterization.

USFWS 2012 – USFWS (U.S. Fish and Wildlife Service). 2012. "Revised recovery plan for the Lost River sucker (*Deltistes luxatus*) and shortnose sucker (*Chasmistes brevirostris*)." Available at https://ecos.fws.gov/docs/recovery_plan/RRP.LstRvrSckr&ShrtnsSckr_1.pdf.

_____ 2019. "Species Status Assessment for the Endangered Lost River Sucker and Shortnose Sucker." Klamath Falls Fish and Wildlife Office, Pacific Southwest Region. Final Report, Version 1. March. Available at https://iris.fws.gov/APPS/ServCat/DownloadFile/164020.

_____ 2024. "Critical habitat for Threatened & Endangered Species, Critical Habitat Mapper." Available at https://ecos.fws.gov/ecp/report/critical-habitat.

_____ 2025. "Lahontan Fish and Wildlife Conservation Office." Available at https://www.fws.gov/office/lahontan-fish-and-wildlife-conservation.

USTMA 2024c – USTMA (U.S. Tire Manufacturers Association). 2024. "Zinc and Tires". Available at https://www.ustires.org/zinc-and-tires.

Van Mourik et al. 2016 – Van Mourik, L., C. Gaus, P.E.G. Leonards, and J. de Boer. 2016. "Chlorinated paraffins in the environment: A review on their production, fate, levels and trends between 2010 and 2015." *Chemosphere*, 155, 415-428. Available at https://doi.org/10.1016/j.chemosphere.2016.04.037.

Varshney et al. 2022 – Varshney, S., A.H. Gora, P. Siriyappagouder, V. Kiron, and P.A. Olsvik. 2022. "Toxicological effects of 6PPD and 6PPD quinone in zebrafish larvae." *Journal of Hazardous Materials*, 424, 127623. Available at https://doi.org/10.1016/j.jhazmat.2021.127623.

Wagner et al. 2018 – Wagner, S., T. Hüffer, P. Klöckner, M. Wehrhahn, T. Hofmann, and T. Reemtsma. 2018. "Tire wear particles in the aquatic environment—a

review on generation, analysis, occurrence, fate and effects." *Water Research*, 139, 83–100. Available at https://doi.org/10.1016/j.watres.2018.03.051.

Wagner et al. 2022 – Wagner, S., P. Klöckner, and T. Reemtsma. 2022. "Aging of tire and road wear particles in terrestrial and freshwater environments - a review on processes, testing, analysis and impact." *Chemosphere*, 288(Part 2), 132467. Available at https://doi.org/10.1016/j.chemosphere.2021.132467.

Wei et al. 2024 – Wei, W., Q. Xu, J. Li, Z. Wang, and G. Li. 2024. "The Spatio-temporal Accumulation of 6PPD-Q in Greenbelt Soils and its Effects on Soil Microbial Communities." *Environmental Pollution*, 358, 124477. Available at https://doi.org/10.1016/j.envpol.2024.124477.

Wentink et al. 1985 – Wentink, G.H., T.J. Spierenburg, G.J. de Graaf, and A.C.A. van Exsel. 1985. "A case of chronic zinc poisoning in calves fed with zinc-contaminated roughage." *Veterinary Quarterly*, 7, 153-157. Available at https://doi.org/10.1080/01652176.1985.9693973.

Yap and Tan 2021 – Yap, K.Y., and M.C. Tan. 2021. "Oil Adsorption onto Different Types of Microplastic in Synthetic Seawater." *Environmental Technology & Innovation*, 24, 101994. Available at https://doi.org/10.1016/j.eti.2021.101994.

Yardy and Callaghan 2021 – Yardy, L., and A. Callaghan. 2021. "Microplastic and Organic Fibres in Feeding, Growth and Mortality of Gammarus Pulex." *Environments*, 8(8), 74. Available at https://doi.org/10.3390/environments8080074.

Zeng et al. 2016 – Zeng, F., J.P. Sherry, and N.C. Bols. 2016. "Evaluating the toxic potential of benzothiazoles with the rainbow trout cell lines, RTgill-W1 and RTL-W1." *Chemosphere*, 155, 308-318. Available at https://doi.org/10.1016/j.chemosphere.2016.04.079.

Zhang et al. 2023 – Zhang, Hai-Yan, Zheng Huang, Yue-Hong Liu, Li-Xin Hu, Liang-Ying He, You-Sheng Liu, Jian-Liang Zhao, and Guang-Guo Ying. 2023. "Occurrence and risks of 23 tire additives and their transformation products in an urban water system." *Environmental International*, 171, 107715. Available at https://doi.org/10.1016/j.envint.2022.107715.

Zheng et al. 2020 – Zheng, X., Q. Sun, S. Wang, X. Li, P. Liu, Z. Yan, X. Kong, and J. Fan. 2020. "Advances in studies on toxic effects of short-chain chlorinated paraffins (SCCPs) and characterization of environmental pollution in China." *Archives of Environmental Contamination and Toxicology*, 78(4), 501–512. Available at https://doi.org/10.1007/s00244-020-00723-0.

3.6.5 Environmental Benefits

Blackburn et al. 2026 – Blackburn, Bill, Julie Burbridge, Andrew Hom, Ralph Lee, Ken Rider, David Sakai, Sebastian Serrato, and Rachel Shuen. 2026. *California's*

Proposed Replacement Tire Efficiency Program. California Energy Commission. Publication Number: CEC-600-2026-012.

Chapter 4

Other Discussions

4 Other Discussions

The State CEQA Guidelines (section 15126.2 et al.) require consideration and discussion of certain mandatory topics in an EIR. Some of these required topics are discussed throughout Chapter 3 of this EIR, including conclusions regarding the significance of adverse impacts on the environment. Discussions of additional required topics are provided in this section, including:

- Significant Irreversible Environmental Changes Caused by Project Implementation
- Growth-Inducing Impacts
- Mandatory Findings of Significance

A discussion of environmental justice is also provided in this section. While not required by CEQA, the CEC considers environmental justice implications as part of its environmental analysis of proposed projects.

4.1 Significant Irreversible Environmental Changes Caused by Project Implementation

Section 15126.2(d) of the State CEQA Guidelines requires EIRs to include a discussion of the significant irreversible environmental changes that would be caused by a project should it be implemented. The uses of nonrenewable resources during the initial and continued phases of a project may be irreversible since a large commitment of such resources makes removal or nonuse thereafter unlikely. Primary impacts and, particularly, secondary impacts often commit future generations to similar uses of nonrenewable resources. Also, irreversible damage can result from environmental accidents associated with certain types of projects. Irretrievable commitments of resources should be evaluated to ensure that the consumption is justified.

No new resources can be identified at this time that might be irreversibly consumed or committed to ensure compliance with the RTEP regulations. Natural resources and fuel are used in the production, distribution, and sale of tires in California. Materials include natural or synthetic elastomers (natural or synthetic rubber), fillers (e.g., carbon black, precipitated silica, or silicates), and chemical additives used in compounding to create the necessary properties for the final rubber product. Examples of fuels include feed-stock fuels used in manufacturing and the fuels used to produce electrical power for tire manufacturing plants, such as coal, natural gas, and oil. There are no tire manufac-turing facilities in California, so the consumption of these materials and fuels occurs outside of the state. Fuel is also consumed to transport raw materials to manufacturing and finished products to distribution centers and wholesale and retail outlets.

The RTEP is not expected to alter the number of tires used by vehicles traveling on California's roadways and is also not expected to cause any significant change in the number of waste tires generated in the State. Rather, the RTEP regulations would result

in phased changes to the design and construction of replacement tires, and some tire manufacturers may elect to alter the composition of tire rubber to lower the rolling resistance of replacement tires. The exact changes to replacement tires that may be prompted by the RTEP cannot be accurately predicted at this time and would likely vary among manufacturers.

4.2 Growth-Inducing Impacts

Public Resources Code (PRC) section 21100(b)(5) requires an agency to include in an EIR a detailed statement setting forth the growth-inducing impact of the proposed project. Section 15126.2(e) of the State CEQA Guidelines address growth-inducing impacts with the following guidance:

> Discuss the ways in which the proposed project could foster economic or population growth, or the construction of additional housing, either directly or indirectly, in the surrounding environment. Included in this are projects which would remove obstacles to population growth (a major expansion of a wastewater treatment plant might, for example, allow for more construction in service areas). Increases in the population may tax existing community service facilities, requiring construction of new facilities that could cause significant environmental effects. Also discuss the characteristic of some projects which may encourage and facilitate other activities that could significantly affect the environment, either individually or cumulatively. It must not be assumed that growth in any area is necessarily beneficial, detrimental, or of little significance to the environment.

A project can have direct or indirect growth-inducing potential. The most direct growth inducement is construction of new housing, which would bring new population to an area.

Indirect growth inducement can result from a project that involves, for instance, any of the following:

- Substantial new permanent employment opportunities (e.g., commercial, industrial, or governmental enterprises);
- Substantial short-term employment opportunities (e.g., construction employment) that indirectly stimulates the need for additional housing and services to support the new temporary employment demand; or
- Removal of an obstacle to additional growth and development, such as removing a constraint on a required public utility or service (e.g., construction of a major sewer line with excess capacity through an undeveloped area).

As indicated throughout this EIR, the RTEP is regulatory and does not involve the approval of any type of construction project. The RTEP would not change any local

zoning requirements, land use planning goals, urban growth boundaries; increase the rate of new construction; or direct the types of buildings or infrastructure to be built or their location. If approved, the proposed regulations would not affect urban development or population growth in any foreseeable way.

Whatever obstacles to population growth currently exist in each community, whether insufficient wastewater treatment capacity, lack of infrastructure, lack of economic opportunity, local zoning laws, or other barriers, the RTEP would not change those barriers, either directly or indirectly. Assembly Bill 844 directed the CEC to develop and maintain a replacement tire efficiency program under PRC sections 25770–25773. The CEC has no statutory authorization to direct or control local land use planning or land use decisions, nor to direct or encourage land development, building construction, or population growth in any jurisdiction.

The RTEP, as a proposed regulatory program, does not have a physical site location. As a result, The RTEP does not have an effect that may attract people into the community or remove conditions that lessen the desirability of living in a given place (e.g., traffic congestion, over-crowded schools, poor employment prospects). Therefore, the project would not have growth-inducing impacts related to traffic congestion, over-crowded schools, or poor employment prospects.

4.3 Environmental Justice

This section analyzes the project's potential impacts on communities with environmental justice concerns. Although environmental justice is not a technical area required to be analyzed under CEQA, the CEC is including this analysis as part of its evaluation of potential environmental impacts. The RTEP is a regulatory program and does not have a physical project site. Therefore, this analysis considers broadly the potential effects of the RTEP on a statewide basis and the potential for any disproportionate environmental effects on communities of concern.

4.3.1 Environmental Setting and Regulatory Background

California law defines environmental justice as "the fair treatment of people of all races, cultures and income with respect to the development, adoption, implementation, and enforcement of environmental laws, regulations, and policies" (Government Code section 65040.12; PRC section 71111). In keeping with its commitment to environmental sustainability and access to all, California was one of the first states to codify the concept of environmental justice in its statutes. Beyond the fair treatment principles described in statute, CEC has included environmental justice analyses in its environmental review of power plant siting cases for over two decades. CEC is committed to embedding energy equity and environmental justice in our energy future (CEC 2023b).

As described above, environmental justice analysis is part of the CEC's site certification process. CEC uses the California Environmental Protection Agency's (CalEPA) California

Communities Environmental Health Screening Tool (CalEnviroScreen) to identify communities with environmental justice concerns.

CEC staff typically conduct environmental justice analyses by taking the following steps:

- Identifying populations with environmental justice concerns (sometimes referred to as disadvantaged communities), living in an area potentially affected by the proposed project;
- Identifying areas potentially affected by various project-related emissions (e.g., air quality, GHG, hazardous materials, etc.) or other project-related nuisance effects (e.g., noise, traffic, etc.);
- Determining the potential for a significant adverse disproportionate impact on identified population with environmental justice concerns resulting from the proposed project alone, or in combination with other existing and/or planned projects in the area (i.e., from cumulative impacts); and
- Providing notice in appropriate languages (when possible) of the proposed project and opportunities for participation in public workshops for disadvantaged communities.

CalEnviroScreen

In 2012, CalEPA developed CalEnviroScreen as a science-based mapping tool that provides an objective method for evaluating multiple pollutants and stressors in local communities, and ultimately for identifying disadvantaged communities pursuant to Health and Safety Code section 39711 as enacted by Senate Bill (SB) 535 (De León, Chapter 830, Statutes of 2012). CalEPA released an updated designation for disadvantaged communities in May 2022 for the purposes of SB 535. As required by State law, disadvantaged communities are identified based on geographic, socioeconomic, public health, and environmental hazard criteria. CalEnviroScreen identifies impacted communities by taking into consideration pollution exposure and its effects, as well as health and socioeconomic status, at the Census-tract level (OEHHA 2021, 8).

The CalEnviroScreen model incorporates 21 indicators that measure a community's exposure, environmental effects, sensitive population, and socioeconomic factors. Indicators for exposure and environmental effects comprise a Pollution Burden group, and indicators for sensitive populations and socioeconomic factors comprise a Population Characteristics group.

Table 4-1 lists the indicators that go into the Pollution Burden score and the Population Characteristics score to form the final CalEnviroScreen score. These indicators are used to measure factors that affect the potential for pollution impacts in communities.

Table 4-1. Components that Form the CalEnviroScreen 4.0 Score

Pollution Burden	
Exposure Indicators	**Environmental Effects Indicators**
Children's lead risk from housing	Cleanup sites
Diesel particulate matter (PM) emissions	Groundwater threats
Drinking water contaminants	Hazardous waste
Ozone concentrations	Impaired water bodies
PM2.5 concentrations	Solid waste sites and facilities
Pesticide use	
Toxic releases from facilities	
Traffic density	
Population Characteristics	
Sensitive Populations Indicators	**Socioeconomic Factors Indicators**
Asthma emergency department visits	Educational attainment
Cardiovascular disease (emergency department visits for heart attacks)	Housing burdened low-income households
Low birth-weight infants	Linguistic isolation
	Poverty
	Unemployment

Notes: PM = particulate matter. PM2.5 = fine particulate matter 2.5 microns or less.
Source: OEHHA 2021

CEC staff assessed project effects on populations with environmental justice concerns by reviewing CalEnviroScreen indicators (see Table 4-1) as they relate to specific technical issues being analyzed. The project-specific Census tracts identified by CalEnviroScreen as disadvantaged are reviewed by CEC technical analysts to determine if any disproportionate burdens would be borne by these populations.

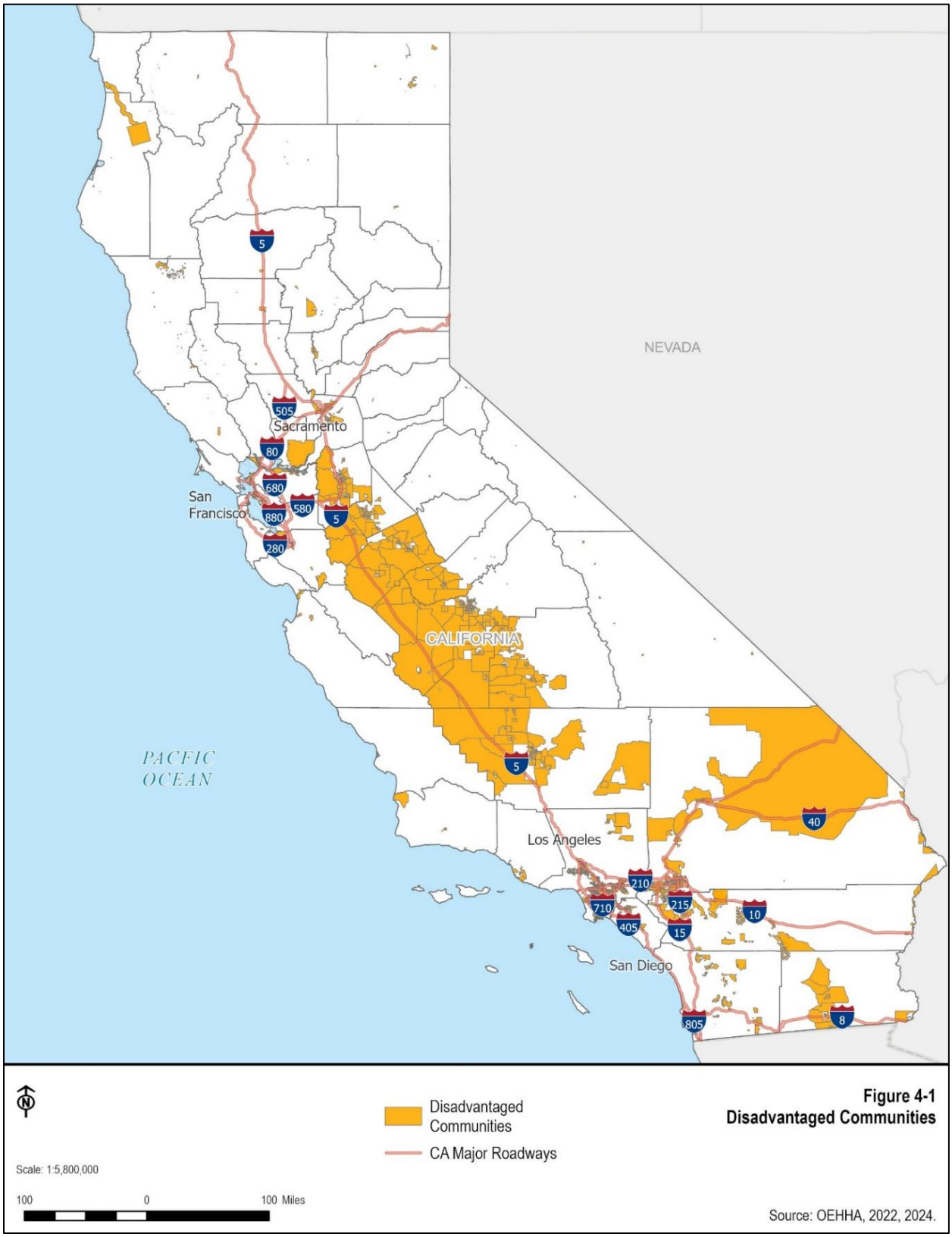
CalEPA released its updated designation of disadvantaged communities for the purpose of SB 535 in May 2022. Disadvantaged communities are defined as follows (OEHHA 2024c):

- Census tracts receiving the highest 25 percent of overall scores in CalEnviroScreen 4.0.
- Census tracts lacking overall scores in CalEnviroScreen 4.0 due to data gaps, but receiving the highest 5 percent of CalEnviroScreen 4.0 cumulative pollution burden scores.
- Census tracts identified in the 2017 Disadvantaged Community (DAC) designation as disadvantaged, regardless of their scores in CalEnviroScreen 4.0.

- Lands under the control of federally recognized Tribes. For purposes of this designation, a Tribe may establish that a particular area of land is under its control even if not represented as such on CalEPA's DAC map and therefore should be considered a DAC by requesting a consultation with the CalEPA Deputy Secretary for Environmental Justice, Tribal Affairs and Border Relations.

Figure 4-1 presents the CalEnviroScreen SB 535 Disadvantaged Communities based on CalEnviroScreen 4.0 data for the state of California. As seen in the figure, the disadvantaged Communities are largely concentrated in the Central Valley, eastern San Bernardino County, with small clusters around the port of Los Angeles and Long Beach.

Figure 4-1: CalEnviroScreen SB 535 Disadvantaged Communities



Source: OEHHA 2024c.

4.3.2 Environmental Considerations

Section 4.3.1 provides a state-level screening to identify SB 535 Disadvantaged Communities as the environmental justice communities considered in this analysis. Upon identification of environmental justice communities, the analysis evaluates if those tracts would receive disproportionate impacts. The analysis considers all unavoidable significant impacts of nuisance effects (i.e., Air Quality; Cultural and Tribal Cultural Resources; Hazards, Hazardous Materials, and Wildfire; Noise and Vibration; Public Health; Solid Waste Management; Transportation; Visual Resources; and Water Resources) for any disproportionate project burdens to environmental justice communities identified in Section 4.3.1. For impacts found to be less than significant, less than cumulatively considerable, or classified as "No Impact" (and therefore also not cumulatively considerable), further evaluation of the potential for disproportionately high and adverse effects on minority and/or low-income populations would not be needed because impacts that would not be significant would not have the potential to result in negative disproportionate effects.

No nuisance effects that were analyzed in this EIR have adverse impact conclusions (see Section 3.1.3, *Environmental Impacts*, and Appendix A, *Initial Study*). Therefore, no further evaluation is needed because there would be no potential for negative disproportionate effects to environmental justice communities.

4.4 Mandatory Findings of Significance

Appendix G of the State CEQA Guidelines asks three questions regarding the mandatory conclusions for the significance of a project's adverse impacts, including conclusions related to plant and wildlife species, California history and prehistory, cumulative effects, and effects on human beings. The answers to those questions are presented below.

Does the project have the potential to substantially degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, substantially reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?

As described in Section 3.4, *Biological Resources*, implementation of the proposed RTEP regulations is not expected to result in any significant impacts to biological resources. Because the RTEP is a regulatory program and does not have a physical site location and does not involve any type of construction or demolition, it does not have the potential to cause any direct impacts on the physical environment, including biological resources such as fish, wildlife, plants, or habitat. The lack of any type of direct physical changes in the environment also means that the RTEP would not threaten any fish or

wildlife populations nor reduce or restrict the range of any rare or endangered species of plant or animal.

Indirect impacts on biological resources are also not expected to be significant. While tires in the environment are known to have some adverse consequences for biological resources, they are relatively minor and would not change with the implementation of the RTEP. 6PPD, a chemical of concern for its adverse effects on Coho salmon, is a compound universally found in tire rubber to improve its durability. The migration and transformation of 6PPD in the environment is suspected of causing the mortality of Coho salmon and may have adverse effects on other aquatic species. 6PPD helps keep tire rubber from degrading or "aging" due to exposure to compounds such as ozone, but it does not have a role in reducing rolling resistance. Therefore, tire manufacturers would have no reason to change the amount of 6PPD in tires to conform to the RTEP regulations.

Depending on changes made to tire formulations, designs, and construction to achieve lower rolling resistance for compliance with the RTEP, it is possible tire waste could increase, resulting in an increase in 6PPD in the environment. However, PRC sections 25770–25773 prohibits the RTEP from increasing tire waste and the program has been designed in a manner to avoid such results. Therefore, no net change in effects on biological resources is anticipated.

As described above, the RTEP is a regulatory program and does not have a physical site location and does not involve any type of construction or demolition. For that reason, the RTEP does not have the potential to directly affect important examples of the major periods of California history or prehistory. The lack of any type of physical changes in the environment means that the RTEP would not directly threaten any historical or prehistorical resources. Because no substantive changes to the distribution, sale, use, or disposal of tires are expected from implementation of the RTEP, no indirect changes to the environment would occur that have the potential to adversely affect historical or prehistorical resources in California. Please see the discussion of Cultural and Tribal Cultural Resources in Appendix A, *Initial Study*.

Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects)?

Section 15130(a) of the State CEQA Guidelines requires a discussion of the cumulative impacts of a project when the project's incremental effect is cumulatively considerable. Cumulatively considerable, as defined in State CEQA Guidelines section 15065(a)(3), means that the "incremental effects of an individual project are significant when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects." State CEQA Guidelines section 15355 defines a

cumulative impact as two or more individual effects that, when considered together, are considerable, or that compound, or increase other environmental impacts. Cumulative impacts can result from individually minor but collectively significant projects taking place over a period of time.

Cumulative impacts are generally assessed using a two-step analysis. The first question is whether the combined effects from both the proposed project and other projects would be cumulatively significant. If yes, the second question is whether the proposed project's incremental effects are cumulatively considerable.

As described in Sections 3.1 through 3.4, the RTEP's adverse environmental impacts are not significant. Where adverse impacts have been identified, the RTEP would make only very minor contributions to potential cumulative effects, resulting in little change in baseline conditions. When considered in the context of other past, current, and probable future projects producing similar impacts, the RTEP's contributions to these effects are not considerable.

While the RTEP's contribution to adverse cumulative impacts is insignificant, its contribution to beneficial environmental changes is substantial. By requiring replacement tires to have lower rolling resistance (making them more efficient), the RTEP would make a substantial contribution to reducing transportation-related fuel consumption (see Section 3.5, *Environmental Benefits*). By reducing the amount of fuel needed to operate passenger cars and light-duty trucks, a reduction in tailpipe emissions would be realized, cumulatively resulting in a substantial reduction in the emission of criteria air pollutants and greenhouse gases. By reducing fuel use, emissions from fuel production (upstream) would also be reduced. These reductions would contribute to improved air quality across the state and help the state meet its goals for curtailing greenhouse gases in the atmosphere, which are the source for human contributions to global climate change. In this way, the RTEP's incremental contribution to beneficial environmental impacts would be cumulatively considerable.

Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?

As detailed in the analysis set forth in Chapter 3 and in the Initial Study (Appendix A), the project would not have any substantial adverse effects on human beings. The RTEP would improve the energy efficiency of replacement tires sold in California, while ensuring that replacement tires continue to provide adequate traction for safety. This efficiency will provide positive impacts for humans by reducing emissions of criteria air pollutants from passenger vehicles and light-duty trucks. The RTEP would reduce emissions of greenhouse gases, from the tailpipes of vehicles from internal combustion engines and upstream emissions from fossil-fuel (primarily natural gas) power plants that provide part of the electricity needed to charge electric vehicles. Reductions in greenhouse gas emissions benefit humans by reducing the contributions that greenhouse gases make toward ongoing climate change, which has multiple adverse

effects on human communities, including more severe weather events, droughts, floods, and coastal erosion and submersion.

4.5 References

CEC 2023b – CEC (California Energy Commission) 2023b. *Appendix A: Justice Access Equity Diversity Inclusion (JAEDI) Framework*. Publication Number: CEC-100-2022-001-CMF-APA. February. Available at https://www.energy.ca.gov/media/8953.

OEHHA 2021 – OEHHA (California Environmental Protection Agency's Office of Environmental Health Hazard and Assessment). 2021. *CalEnviroScreen 4.0*. October. Available at https://oehha.ca.gov/media/downloads/calenviroscreen/report/calenviroscreen40reportf2021.pdf.

OEHHA 2024c – OEHHA (California Environmental Protection Agency's Office of Environmental Health Hazard and Assessment). 2024c. SB 535 Disadvantaged Communities. Available at https://oehha.ca.gov/calenviroscreen/sb535.

Chapter 5

Alternatives

5 Alternatives

5.1 Introduction

This section evaluates a reasonable range of alternatives to the proposed Replacement Tire Efficiency Program (RTEP). Alternatives selected for analysis are limited to those that could feasibly meet most of the project's basic objectives while reducing or avoiding any significant impacts. Since no significant adverse effects on the environment have been identified for the project, alternatives were selected that could reduce the reasonably foreseeable but less-than-significant impacts that could result from the project. This section also discusses alternatives that were considered by CEC staff and the reasons these alternatives were excluded from further analysis.

In addition to the No Project Alternative, the EIR evaluates and discusses the following alternatives:

- More Stringent Minimum Performance Standard
- Less Stringent Minimum Performance Standard

5.2 CEQA Requirements

Section 15126.6 of the State CEQA Guidelines[50] require that an EIR consider and discuss alternatives to a proposed project that:

- Describe a range of reasonable alternatives to the project or its location which would feasibly attain most of the basic objectives of the project but would avoid or substantially lessen any of the significant effects of the project;
- Evaluate the comparative merits of the alternatives;
- Focus on alternatives to the project or its location which are capable of avoiding or substantially lessening any significant effects of the project, even if these alternatives would impede to some degree the attainment of the project objectives or would be more costly;
- Describe the rationale for selecting the alternatives to be discussed;
- Identify any alternatives that were considered by the lead agency but were rejected as infeasible during the scoping process and briefly explain the reasons underlying the lead agency's determination; and
- Include sufficient information about each alternative to allow meaningful evaluation, analysis, and comparison with the proposed project.

[50] CEQA Guidelines, 14 CCR § 15126.6.

Alternatives may be eliminated from detailed consideration for failure to meet most of the basic project objectives, infeasibility, or inability to avoid significant environmental impacts.

The "no project" alternative and its impact shall be evaluated to allow decisionmakers to compare the impacts of approving the proposed project with the impacts of not approving the proposed project. The "no project" analysis shall discuss the existing conditions, as well as what would be reasonably expected to occur in the foreseeable future if the project were not approved, based on current plans and consistent with available infrastructure and community services. If the environmentally superior alternative is the "no project" alternative, the EIR shall also identify an environmentally superior alternative among the other alternatives.

5.3 Project Objectives and Alternatives Screening

Public Resources Code (PRC) sections 25770–25773 require the CEC to develop and maintain a replacement tire efficiency program under. The primary objective of the RTEP is to establish a program designed to ensure that replacement tires sold in the state of California are at least as energy efficient, on average, as the tires sold in the state as original equipment on these vehicles.

PRC sections 25770–25773 direct the CEC to develop the RTEP to meet the following base objectives:

- Develop a database of the energy efficiency of a representative sample of replacement tires sold in the state, based on test procedures adopted by the CEC.
- Develop a rating system for tires, based on information collected through the database, that will enable consumers to make more informed decisions when purchasing tires for their vehicles.
- Establish requirements for tire manufacturers to report to the CEC the energy efficiency of replacement tires sold in the state.
- Develop and adopt minimum energy efficiency standards for replacement tires. These standards shall:
    - Be technically feasible and cost effective.
    - Not adversely affect tire safety.
    - Not adversely affect the average life of replacement tires.
    - Not increase the amount of scrap tires generated in California, nor adversely affect state efforts to manage scrap tires.

The CEC proposes the following regulation components and effective dates to meet the base objectives of PRC sections 25770–25773 (Table 5-1).

Table 5-1: Key Regulation Components

Regulation component	Effective date
Reporting requirements for tire manufacturers for inclusion in the CEC's database	January 1, 2028
Energy Performance Standard	Phase I - January 1, 2028 Phase II - January 1, 2031
Relative Wet Grip Braking Performance Index Performance Standard	January 1, 2028

Source: Blackburn et al. 2026, Chapter 5.

The proposed RTEP would set replacement tire efficiency minimum performance standards, differentiated by tire product category and effective date (Table 5-2). The standards are expressed as a rolling resistance coefficient (RRC) in newtons/ kilonewtons as defined by the International Organization for Standardization (ISO) Test Protocol 28580:2018. The minimum performance standard sets the maximum RRC a replacement tire in each regulated class can have, to be legally sold in California (Blackburn et al. 2026, ES). It is important to note that the proposed implementation dates do not affect the environmental impact analysis, though they do affect projected fuel cost savings and reduced greenhouse gas emissions.

Table 5-2: Replacement Tire Efficiency Minimum Performance Standard (RRC)

Tire Category	Phase 1: 1/1/2028	Phase 2: 1/1/2031
Base tires	9.0	7.1
Low-load index tires	9.5	7.6
Light-duty truck tires	9.0	7.8
Long-life tires	9.4	7.8
Ultra long-life and ultra high-performance tires	9.8	8.5

Source: Blackburn et al. 2026, Chapter 5.

It is anticipated that the proposed program will lead to overall improved environmental quality in California and aid the state's efforts to simultaneously improve public health and reduce carbon emissions (GHGs) over the long term. The potential energy, cost savings, and environmental benefits include (Blackburn et al. 2026, Chapters 8-9):

- CEC staff estimate that, if adopted, the regulations will increase the efficiency of California passenger and light-duty vehicles by about 2.0 percent overall, equivalent to roughly $979 million in fuel savings.
- Increased vehicle fuel efficiency and fuel cost savings for consumers over the life of the replacement tire is expected to outweigh the incremental purchase cost of

low-rolling resistant tires. The estimated gasoline savings are 39 gallons ($179) for a lighter vehicle and 54 gallons ($246) for a heavier vehicle, with estimated incremental purchase costs of $26 and $39, respectively. In total, staff estimates a net benefit of $153 to $207 per vehicle over the four-year lifespan of an average set of tires covering 45,000 miles.

- Expected statewide energy savings in 2035 include an estimated potential annual reduction of 3.4 million gallons of diesel, 141.1 million gallons of gasoline, 0.9 terawatt-hours of electricity, and 0.5 million kilograms of hydrogen.[51]
- Reductions in tailpipe GHG emissions (CO_2, CH_4, N_2O), and reductions in the upstream emissions of vehicle fuels (gasoline and diesel extraction, refinement, and transport; electricity production and distribution). The estimated potential annual GHG reduction of the RTEP is 2.0 million metric tons (MMT) CO_2-equivalent in 2035.
- Reductions in criteria air pollutants stemming from vehicle fuel combustion (NOx, SOx, PM2.5, and ozone). The estimated potential annual criteria pollutant reduction of the RTEP is 426 tons of NOx and 10 tons of PM2.5 in 2035.

More detail on the proposed RTEP is provided in Chapter 2, *Project Description*.

The following sections discuss whether the alternatives selected for analysis, as well as the alternatives considered and excluded from analysis, could feasibly meet most of the project's base objectives while reducing or avoiding adverse environmental impacts.

5.4 Alternatives Selected for Analysis

5.4.1 No Project Alternative

Evaluation of a No Project Alternative in an EIR is required by CEQA.[52] However, adoption of the No Project Alternative is not an option for the RTEP because PRC sections 25770–25773 require the CEC to develop and maintain a replacement tire efficiency program.

With the No Project Alternative, the CEC would not develop or maintain a Replacement Tire Efficiency Program. The CEC would not develop a database of the energy efficiency of a representative sample of replacement tires sold in the state, develop a rating system for the energy efficiency of replacement tires sold in the state that will enable consumer to make more informed decisions when purchasing tires for their vehicles, or develop requirements for tire manufacturers to report to the CEC the energy efficiency of replacement tires sold in the state. The potential impacts associated with implement-ation of the RTEP described in Sections 3.1 through 3.4, although not significant, would not occur under the No Project Alternative.

[51] These calculations assume a regulation compliance rate of 90 percent.

[52] 14 CCR § 15126.6(e).

Under the No Project Alternative, there would be no change in baseline conditions, and no new adverse environmental impacts would occur; however, the environmental benefits associated with the RTEP also would not occur. Consumers would continue to lack accurate information on the relative efficiency of various replacement tires. Energy and cost savings for individual consumers and statewide energy, environmental, and public health benefits would not be realized. While the No Project Alternative is feasible, it does not meet any of the RTEP's base objectives. The No Project Alternative would not provide the environmental benefits of the RTEP because the RTEP's significant estimated fuel savings and annual reductions in GHG emissions and criteria air pollutants would not be realized.

5.4.2 Alternative 1: More Stringent Minimum Performance Standard

Under this alternative, the CEC would develop a tire efficiency database and rating system, establish reporting requirements for tire manufacturers, develop and adopt minimum energy efficiency standards for replacement tires, and pursue rulemaking to implement a replacement tire efficiency program. This alternative would include all the base objectives of the proposed RTEP but establish more stringent levels for the minimum efficiency performance standard than the proposed project.

The proposed RTEP would establish a replacement tire efficiency minimum performance standard (MPS) of 9.0 to 9.8 RRC that would apply to the sale of new replacement tires starting on January 1, 2028 (Phase I), with a more stringent standard of 7.1 to 8.5 RRC on January 1, 2031 (Phase II). The differences in the RRC range apply to different replacement tire types (base tires versus long-life tires, etc.).

Alternative 1 is the MPS originally proposed by the CEC in the *Draft Framework of California's Replacement Tire Efficiency Program* (February 2023). Under this alternative, a more stringent MPS of 8.3 RRC would take effect on the Phase I implementation date, and decrease to 6.3 RRC on the Phase II implementation date. (Note that the RRC values, as well as some estimates used here have been adjusted or corrected and are not directly comparable to ones found in the *Draft Framework Report)*. Compared to the proposed project, CEC staff estimated that this alternative would potentially provide the following annual savings beginning in 2035.

Table 5-3: Benefits Comparison of Alternative 1 and Proposed Project

Benefit Category	More Stringent MPS	Proposed Project MPS
Consumer savings from reduced fuel use	$1.8 billion	$0.98 billion
GHG reduction	3.6 MMT CO_2e	2.0 MMT CO_2e
Gasoline use reduction	257.1 million gallons	141.1 million gallons
Diesel use reduction	5.4 million gallons	3.4 million gallons

Benefit Category	More Stringent MPS	Proposed Project MPS
Electricity use reduction	1.6 terawatt-hours	0.9 terawatt-hours
Hydrogen use reduction	0.7 million kilograms	0.5 million kilograms
NOx reduction	1,485	426
PM2.5 reduction	239	10

Source: Blackburn et al. 2026, Chapters 6, 8 and 9.

Setting the MPS at Alternative 1 levels would produce substantial fuel savings for consumers and significantly lowered GHG emissions and criteria pollutants. As shown in the comparison table, setting a more stringent MPS results in commensurate benefits in all the categories listed (Table 5-3).

However, it would be difficult for the tire industry to meet the regulations of Alternative 1 due to the lead time necessary to develop and begin manufacturing compliant tires. Tire industry companies and representatives suggested that the stringent MPS proposed in Alternative 1 could cause some tire manufacturers to leave the California market, which would limit both the supply and variability of tires offered to consumers because a large percentage of current tire models would not be able to meet the more stringent MPS. Thus, setting the MPS much lower than 7.1 could potentially result in negative impacts to the supply, price, and diversity of replacement tires sold in the state (Blackburn et al. 2026, Chapter 6).

Solid Waste

No significant adverse impacts related to solid waste were identified for the proposed RTEP (see Section 3.1, *Utilities and Service Systems: Solid Waste*). With Alternative 1, the rolling resistance MPS for replacement tires would be more stringent and compliance would occur sooner than under the proposed RTEP. Alternative 1 also would not include adjustments to the MPS for certain categories of replacement tires to accommodate their specialized uses and functions (e.g., low-load index tires, light-duty truck tires, long-life tires, and ultra long-life and ultra high-performance tires). These adjustments are necessary to ensure that the unique performance characteristics of these types of tires are maintained, while also improving their efficiency. Therefore, it would be more challenging for tire manufacturers to comply with Alternative 1.

As discussed in Section 3.1.3.2, CEC staff did not identify significant and widespread tradeoffs in wear resistance, fuel efficiency, and relative wet grip braking performance (traction) with the proposed MPS. In the analysis for Alternative 1, CEC staff similarly found that the more stringent MPS was technically feasible with no significant impact on safety (traction) or tire life (wear resistance) (Blackburn et al. 2023). Thus, CEC staff expect the impacts of Alternative 1 on solid waste would be similar to the proposed project, and no significant impacts would occur.

Hazardous Materials

No significant adverse impacts related to hazardous materials were identified for the proposed RTEP (see Section 3.2, *Hazardous Materials*). However, the analysis in Section 3.2 acknowledges that tire rubber currently contains multiple chemical compounds that have either been shown to be harmful to the environment or are suspected of causing harm. Further study of the compounds in tire rubber is required to more fully understand their effects on the environment and to identify replacement compounds if necessary. With Alternative 1, impacts related to hazardous materials would be essentially the same as described for the proposed RTEP. While Alternative 1 would impose a more stringent MPS, there is no basis for assuming that more environmentally harmful substances would be used in tire rubber in order to meet the Alternative 1 MPS.

Tire rubber is formulated differently among tire manufacturers according to proprietary formulas and methods. Such differences would continue to exist under Alternative 1, as well as with the proposed RTEP. Tire rubber continues to evolve to better meet the desired or specified performance characteristics of tires. As replacement tires evolve to become more energy efficient, the design and composition of tire rubber will undoubtedly change over time, although not in ways that can be accurately predicted at this time. Each tire manufacturer will need to pursue further R&D to determine how best to improve the energy efficiency of their tires, including adjustments to tire design and construction, as well as to the composition of tire rubber. The changes prompted by such research are expected to vary by manufacturer. The tire industry is highly competitive, and the exact nature of these changes is not foreseeable at this time and may never be fully known due to the proprietary status of this information among individual tire manufacturers.

Over time, as the harmful effects of some chemical compounds become better understood, their use may be reduced or phased out in tire manufacturing, either voluntarily, in response to consumer pressure, or government regulation. This cannot be accurately predicted at this time. The state's Department of Toxic Substances Control (DTSC) has finalized a regulation pursuant to the Safer Consumer Products Regulations to list motor vehicle tires containing 6PPD[53] as a new Priority Product. This may eventually lead to the elimination of 6PPD in tires sold in California.

CEC staff expect that the impacts of Alternative 1 related to hazardous materials would be similar to the proposed project, and no significant impacts would be expected to occur.

Air Quality

No significant adverse impacts related to air quality were identified for the proposed RTEP (see Section 3.3, *Air Quality*). Rather, beneficial impacts were identified related to the emission of criteria pollutants and greenhouse gases. As described in Section 3.3,

[53] N-(1,3-dimethylbutyl)-N'-phenyl-p-phenylenediamine

more efficient replacement tires for passenger cars and light-duty trucks will increase fuel efficiency, resulting in less fuel consumed for each mile these vehicles are driven. This reduction in fuel consumption and combustion will result in the emission of fewer air pollutants and greenhouse gases, thereby producing a beneficial effect for air quality while reducing greenhouse gases that contribute to climate change.

With Alternative 1, the same air quality and greenhouse gas benefits as the proposed RTEP would be realized, but to a greater degree. That is because the more stringent MPS of Alternative 1 would result in a higher overall degree of energy efficiency for replacement tires, thereby resulting in even greater fuel efficiency benefits than the proposed Project. That would lead to a greater reduction in air pollutant emissions and greenhouse gas emissions, resulting in an increased air quality and greenhouse gas benefit when compared to the proposed project. CEC staff expects the impacts to air quality for Alternative 1 to be similar to the proposed project. Thus, the air quality effects of Alternative 1 would be beneficial to the environment.

Biological Resources

No significant adverse impacts related to biological resources were identified for the proposed RTEP (see Section 3.4, *Biological Resources*). However, the analysis in Section 3.4 acknowledges that tire rubber currently contains certain chemical compounds that have been shown to be harmful to aquatic organisms. Additional compounds are suspected of causing harm, although further study is needed to confirm harmful effects. With Alternative 1, impacts related to biological resources would be essentially the same as described for the proposed RTEP. While Alternative 1 would impose a more stringent MPS, CEC staff believe there is no clear basis for assuming that more substances that are harmful to the aquatic environment would be used in tire rubber in order to meet the Alternative 1 MPS.

As described above for Hazardous Materials, tire rubber is formulated differently among tire manufacturers according to proprietary formulas and methods. Such differences would continue to exist under Alternative 1, as well as with the proposed RTEP. The design and composition of replacement tires is expected to continue to evolve over time to improve tire performance, including improved energy efficiency. However, the precise nature of the evolutionary changes in tire design and composition that will occur is unknown.

As described above for Solid Waste, the RTEP minimum performance standards have been designed to reduce the rolling resistance of replacement tires while avoiding a decrease in tire life. Replacement tires under the proposed project would likely not result in an increase in the shedding of TWPs from replacement tires. Due to the stricter energy efficiency MPS of Alternative 1 and the shorter timeframe for compliance, it is possible that the tread life of replacement tires could be adversely affected in favor of efficiency, at least in the short term until tire manufacturers have time to make the necessary adjustments to replacement tires. If tire treads were to wear out more

quickly than replacement tires currently on the market, it is possible that there could be an increase in the generation of TWPs in the near term. TWPs represent the primary source of chemical compounds from tires that are harmful to aquatic organisms when introduced into the environment.

Overall, CEC staff expect that the impacts of Alternative 1 on biological resources would be similar to the proposed project, although there is a slightly greater potential for the generation of an increased amount of TWPs in the near term. Despite this possibility, impacts on biological resources for Alternative 1 are still expected to be less than significant.

5.4.3 Alternative 2: Less Stringent Minimum Performance Standard

Under this alternative, the CEC would develop a tire efficiency database and rating system, establish reporting requirements for tire manufacturers, develop and adopt minimum energy efficiency standards for replacement tires, and pursue rulemaking to implement a replacement tire efficiency program. This alternative would include all the base objectives of the proposed RTEP but establish less stringent levels for the minimum efficiency performance standard than the proposed project.

The proposed RTEP would establish a replacement tire efficiency MPS of 9.0 to 9.8 RRC that would apply to the sale of new replacement tires starting on January 1, 2028 (Phase I) and decrease to 7.1 to 8.5 RRC on January 1, 2031 (Phase II). The differences in RRC apply to different replacement tire types (base tires versus long life tires, etc.).

Following CEC staff's release of the *Draft Framework of California's Replacement Tire Efficiency Program* in 2023, tire industry stakeholders proposed a less stringent MPS of 9.7 RRC to take effect on the Phase I implementation date and decrease to 8.7 RRC on the Phase II implementation date.[54] This alternative produces significantly less consumer, GHG, and energy savings benefits than either the staff proposal or Alternative 1. Compared to the proposed project, CEC staff estimated that Alternative 2 would potentially provide the following annual savings beginning in 2035.

Table 5-4: Benefits Comparison of Alternative 2 and Proposed Project

Benefit Category	Less Stringent MPS	Proposed Project MPS
Consumer savings from reduced fuel use	$0.3 billion	$0.98 billion
GHG reduction	0.5 MMT CO_2e	2.0 MMT CO_2e
Gasoline use reduction	35.8 million gallons	141.1 million gallons

[54] This alternative is based on meetings with the United States Tire Manufacturing Association (USTMA) and the Tire and Rubber Association of Canada (TRAC), as well as comments submitted regarding a suggested MPS following the release of the CEC's Draft Framework. Source: USTMA/TRAC letter dated March 23, 2023, submitted to CEC Docket No. 20-Tire-01 (CEC 2023a).

Benefit Category	Less Stringent MPS	Proposed Project MPS
Diesel use reduction	0.9 million gallons	3.4 million gallons
Electricity use reduction	0.2 terawatt-hours	0.9 terawatt-hours
Hydrogen use reduction	0.1 million kilograms	0.5 million kilograms
NOx reduction	N/A	426
PM2.5 reduction	N/A	10

Source: CEC staff; Blackburn et al. 2026, Chapter 6, 8 and 9.

PRC sections 25770–25773 mandate the CEC to develop a program designed to ensure that replacement tires are as efficient as OE tires without compromising safety, cost-effectiveness, or creating excess tire waste. Tests at Smithers Laboratory show OE tires have an average rolling resistance coefficient of approximately 7.1 (European Union correlated value). Since Alternative 2 does not meet this standard, it was rejected by CEC staff for non-compliance with PRC sections 25770–25773. Additionally, this alternative would provide limited consumer savings and environmental benefits compared to the proposed program.

In this scenario, it may be less difficult for the tire industry to meet the standard. However, consumers would miss out on the fuel savings and environmental and health benefits associated with more fuel-efficient tires. The state's goals to address climate change (GHG emission reductions) and air quality (criteria pollutants and toxic air contaminants) would also suffer, commensurate with where the efficiency standards were set.

Solid Waste

No significant adverse impacts related to solid waste were identified for the proposed RTEP (see Section 3.1, *Utilities and Service Systems: Solid Waste*). With Alternative 2, the rolling resistance MPS for replacement tires would be less stringent than under the proposed RTEP. Alternative 2 also would not include adjustments to the MPS for certain categories of replacement tires to accommodate their specialized uses and functions. Due to the less stringent MPS for rolling resistance, it would generally be less challenging for tire manufacturers to comply with the requirements of Alternative 2. However, because Alternative 2 would not include adjustments to the MPS for certain categories of replacement tires, challenges for manufacturers may still exist for some replacement tires.

As described for Alternative 1, tire manufacturers would need to balance three important aspects of tire performance (tread wear, traction, and energy efficiency) to meet the requirements of Alternative 2. As discussed in Section 3.1.3.2, CEC staff did not identify significant and widespread tradeoffs in wear resistance, fuel efficiency, and relative wet grip braking performance (traction) with the proposed MPS. Similarly, the

less stringent MPS under Alternative 2 is not expected to result in any tradeoffs between wear, efficiency, or relative wet grip braking performance. Moreover, testing conducted on behalf of the CEC found over half of the replacement tires tested already meet or exceed an RRC of 8.7, which is the MPS to be achieved by the Phase II implementation date under Alternative 1. Therefore, CEC staff do not expect Alternative 2 to lead to any substantial reductions in average tire life that would lead to an increase in the generation of waste tires.

Because so many replacement tires on the market already meet or exceed an RRC of 8.7, the impact of Alternative 2 on solid waste would be similar to the No Project Alternative, which represents a continuation of the baseline condition. CEC staff expect impacts on solid waste for Alternative 2 to be less than significant.

Hazardous Materials

No significant adverse impacts related to hazardous materials were identified for the proposed RTEP (see Section 3.2, *Hazardous Materials*). However, the analysis in Section 3.2 acknowledges that tire rubber currently contains multiple chemical compounds that have either been shown to be harmful to the environment or are suspected of causing harm. With Alternative 2, impacts related to hazardous materials would be essentially the same as the No Project Alternative because most replacement tires tested already have an RRC of 8.7 or better. Therefore, under Alternative 2, the formulation of tire rubber would not need to change in any substantial way compared to baseline conditions. As a result, there is no reason to assume that more environmentally harmful substances would be used in replacement tires to achieve the Alternative 2 MPS.

Under Alternative 2, differences in tire rubber formulations would continue to exist among manufacturers. As replacement tires evolve to become more energy efficient, the composition of tire rubber will undoubtedly change over time, although not in ways that can be accurately predicted at this time. As described above for Alternative 1, the exact nature of these changes is not foreseeable at this time and may never be fully known due to the proprietary status of this information among individual tire manufacturers.

CEC staff anticipate that the impacts of Alternative 2 related to hazardous materials would be similar to the No Project Alternative, and no significant impacts would occur.

Air Quality

No significant adverse impacts related to air quality were identified for the proposed RTEP (see Section 3.3, *Air Quality*). Rather, beneficial impacts were identified related to the emissions of criteria pollutants and greenhouse gases. As described in Section 3.3, more efficient replacement tires for passenger cars and light-duty trucks will increase fuel efficiency, resulting in less fuel consumption. This reduction in fuel consumption and combustion will result in the emission of fewer air pollutants and greenhouse

gases, thereby producing a beneficial effect for air quality while reducing greenhouse gases that contribute to climate change.

Because Alternative 2 has a less stringent MPS for rolling resistance, it would generally be less challenging for tire manufacturers to comply with the requirements of Alternative 2. Therefore, there is reduced potential for short-term increases treadwear and associated increases in the generation of TWPs compared to Alternative 1.

With Alternative 2, the air quality and greenhouse gas benefits of the proposed RTEP would be realized, but to a lesser degree. The less stringent MPS of Alternative 2 would result in a lower overall degree of energy efficiency for replacement tires, thereby resulting in reduced fuel efficiency benefits when compared to the proposed project. The results would be smaller reductions in air pollutant emissions and greenhouse gas emissions and somewhat reduced air quality benefits compared to the proposed project. Overall, the air quality effects of Alternative 2 would still be modestly beneficial to the environment.

Biological Resources

No significant adverse impacts related to biological resources were identified for the proposed RTEP (see Section 3.4, *Biological Resources*). However, the analysis in Section 3.4 acknowledges that tire rubber currently contains certain chemical compounds that have been shown to be harmful to aquatic organisms. Additional compounds are suspected of causing harm, although further study is needed to confirm harmful effects. With Alternative 2, impacts related to biological resources would be essentially the same as described for the proposed RTEP. CEC staff believe there is no clear basis for assuming that more substances that are harmful to the aquatic environment would be used in tire rubber in order to meet the Alternative 2 MPS.

Under Alternative 2, differences in tire rubber formulations would continue to exist among manufacturers. The design and composition of replacement tires is expected to continue to evolve over time in order to improve tire performance and energy efficiency. The precise nature of such evolutionary changes in tire design and composition is unknown.

The RTEP minimum performance standards have been designed to reduce the rolling resistance of replacement tires while avoiding a decrease in tire life. Assuming this goal is realized, replacement tires under the proposed project would not result in an increase in the shedding of tire wear particles (TWPs) from replacement tires. TWPs represent the primary source of chemicals in tires that are harmful to aquatic organisms when introduced into the environment.

Overall, CEC staff expect that the impacts of Alternative 2 on biological resources would be similar to the proposed project and no significant impacts would occur.

5.5 Alternatives Considered and Not Evaluated Further

The following alternatives were considered by CEC staff. However, these alternatives did not meet the basic objectives of the RTEP, were not feasible, or did not have the potential for avoiding or lessening environmental impacts. Therefore, these alternatives have been eliminated from further consideration in the EIR.

5.5.1 Consumer Information Program Only

Under this alternative, the CEC would develop a consumer information program on fuel-efficient replacement tires. The CEC would not collect rolling resistance data from tire manufacturers, develop an efficient tire rating system, establish minimum efficiency performance standards for tire manufacturers, nor pursue rulemaking to implement a replacement tire efficiency program. This alternative is not consistent with the requirements of PRC sections 25770–25773.

The CEC would conduct research on tire efficiency and share this data with consumers through the CEC's website, reports, brochures, conferences, and other avenues. However, tire manufacturers and dealers would not be required to provide this information to the consumer at the point-of-sale nor display tire efficiency information as a tire rating (beyond what is required by UTQG standards). While consumers would receive general information on efficient tires, without having access to data on the efficiency of individual tire models, they would remain limited in their ability to make informed decisions.

PRC sections 25770–25773 require the CEC to design and implement a comprehensive replacement tire efficiency program in addition to a consumer information program, and the consumer information-only alternative would potentially put the CEC in a position of not complying with California statute unless sufficient rationale determined that the CEC could not reasonably pursue the proposed RTEP. While feasible, a consumer information program would only partially meet the RTEP's base objectives, and result in a fraction of consumers adopting high efficiency replacement tires when compared to the projected adoption rates under a fully implemented RTEP. The anticipated environmental, public health, and economic benefits would be substantially less under a consumer information-only alternative. Therefore, CEC staff eliminated this alternative from further consideration in the EIR.

5.5.2 Tire Efficiency Rating System Only

Under this alternative, the CEC would develop a tire efficiency rating system. The CEC would pursue rulemaking to develop a regulation to compel tire manufacturers to periodically report data on the rolling resistance of replacement tires sold in the state. The reported data would be used to develop a replacement tire energy efficiency database. The CEC would not establish minimum tire efficiency standards for tire manufacturers under this alternative.

The reported data would provide valuable information to allow consumers to be better informed on the impacts to fuel economy based on individual tire models. However, since no minimum efficiency standards would be established, tire manufacturers and dealers would be allowed to continue producing and selling all current tire models, including inefficient, high rolling resistance tires.

While developing a tire efficiency rating system is feasible, this alternative only partially meets the base objectives of the RTEP. Without a minimum efficiency standard, tire manufacturers have no incentive to produce or sell more energy efficient tires. It would also be possible for tire manufacturers to produce even less efficient tires than what are currently on the market. Although the rating system would provide consumers more data on replacement tire efficiency, their options would be limited to what would be on the market (or what tire manufacturers voluntarily choose to produce), and adoption rates for high efficiency replacement tires would be a fraction of those projected under a fully implemented RTEP. Thus, the anticipated benefits would be substantially less, and this alternative would result in more adverse environmental impacts as compared to the proposed RTEP. Therefore, CEC staff eliminated this alternative from further consideration in the EIR.

5.5.3 Delay Program Implementation

Under this alternative, development and implementation of a replacement tire efficiency program would be postponed for an extended period (i.e., several years). Delaying the program would benefit tire manufacturers and retailers, as they would not be required to make changes to replacement tire production to meet efficiency standards or report tire efficiency data to the CEC.

Similar to the No Project Alternative, delaying program implementation means that energy and cost savings for individual consumers and statewide energy, environmental, and public health benefits would not be realized. While this alternative is feasible, it does not meet any of the RTEP's base objectives and would make the CEC non-compliant with PRC sections 25770–25773. The delay program implementation alternative would result in significantly more adverse environmental impacts, because the RTEP's estimated annual reductions in GHG emissions and criteria air pollutants would not be realized.

5.6 Environmentally Superior Alternative

In accordance with CEQA requirements, an "environmentally superior alternative" must be identified among the alternatives analyzed in an EIR.[55] The environmentally superior alternative is the alternative found to have an overall advantage compared to the other alternatives based on the impact analysis in the EIR.

[55] 14 CCR § 15126.6(e)(2).

The environmentally superior alternative is generally considered to be the alternative that would result in the fewest significant environmental impacts. Simply tallying the number of significant environmental impacts can sometimes be misleading, because some significant impacts may be more serious or substantive than others. For instance, a temporary impact can be significant, but a long-term or permanent significant impact is often more important to consider when comparing the impacts among alternatives. Similarly, some resources are considered more important or sensitive than others. For example, impacts on threatened or endangered species would be considered more substantive than impacts on common species.

Of the alternatives analyzed, the No Project Alternative would result in no new environmental impacts but would not provide the environmental benefits of the proposed project, including long-term GHG and air pollutant emission reductions and improved fuel economy for passenger cars and light-duty trucks. Due to the absence of these beneficial effects, the No Project Alternative is not considered the environmentally superior alternative even though no new environmental impacts would occur under this alternative.

In the case of the proposed project, CEC staff have identified no significant adverse environmental impacts related to the RTEP. Similarly, the impacts of the alternatives discussed above in Section 5.4 are also not significant. Therefore, the identification of the environmental superior alternative (other than the No Project Alternative) is based on a combined consideration of adverse environmental effects, environmental benefits, and feasibility.

- **Proposed Project.** The proposed RTEP provides three primary environmental benefits: improved fuel economy, reduced air pollutant emissions, and reduced GHG emissions. Significant adverse environmental impacts are avoided through the crafting of minimum performance standards that improve the energy efficiency of replacement tires while avoiding increased tread wear. This is primarily achieved through adjustments to the MPS for the categories of tires listed in Table 5-2 (low-load index tires, light-duty truck tires, long-life tires, and ultra long-life and ultra high-performance tires). Because the MPS is tailored to different categories of replacement tires, CEC staff anticipate that the proposed RTEP will realize its intended environmental benefits without creating significant environmental impacts and without having a substantial adverse effect tread wear or relative wet grip braking performance.
- **Alternative 1: More Stringent Minimum Performance Standard.** Similar to the proposed project, CEC staff do not expect the implementation of Alternative 1 to result in significant adverse environmental impacts. However, its single MPS for all types of replacement tires would make compliance more difficult for tire manufacturers to achieve, especially in a relatively short time frame. The environmental benefits of Alternative 1 would be greater than those of the proposed project because replacement tires under Alternative 1 would be

subject to a more stringent MPS that would result in a higher level of energy efficiency for all replacement tires sold in California.

- **Alternative 2: Less Stringent Minimum Performance Standard.** Alternative 2 would avoid significant adverse environmental impacts but would provide a lower level of environmental benefit. The less-stringent MPS of Alternative 2 would make it easier for tire manufacturers to comply with the energy efficiency standards for replacement tires.

Based on the characteristics of the proposed project and the alternatives discussed above and the expected consequences of their implementation, CEC staff have concluded that the proposed project is the superior option for the RTEP. This is because of its balancing of environmental benefits against the maintenance of desirable tire characteristics, primarily tread wear and relative wet grip braking performance. The proposed project is more feasible than Alternative 1, and Alternative 2 is even more feasible (but with reduced environmental benefits).

When considering only the alternatives and not including the proposed project in the consideration, CEC staff have concluded that Alternative 1 is environmentally superior because it provides the greatest amount of environmental benefit without significant adverse environmental impacts. However, the difficulty in achieving the stringent MPS of Alternative 1 introduces the possibility of undesirable consequences, such as the possibility that achievement of the stringent MPS in a short period of time could adversely affect tread wear or relative wet grip braking performance or the potential for companies failing to comply with the regulations.

The CEC is under no obligation to adopt the environmentally superior alternative. Identification of the environmentally superior alternative is an EIR requirement, but it does not constrain or limit the CEC's decision on the proposed project. In rendering a decision on the project, CEC commissioners will need to consider other factors in addition to the project's environmental impacts and benefits.

5.7 References

Blackburn et al. 2023 – Blackburn, Bill, Jontae Clapp, Andrew Hom, Ralph Lee, Tim Olson, Ken Rider, and Sebastian Serrato. 2023. *Draft Framework of California's Replacement Tire Efficiency Program*. California Energy Commission. Docket Number: 20-TIRE-01. Publication Number: CEC-600-2023-026-SD. February.

Blackburn et al. 2026 – Blackburn, Bill, Julie Burbridge, Andrew Hom, Ralph Lee, Ken Rider, David Sakai, Sebastian Serrato, and Rachel Shuen. 2026. *California's Proposed Replacement Tire Efficiency Program*. California Energy Commission. Publication Number: CEC-600-2026-012.

CEC 2023a – CEC (California Energy Commission). 2023a. *Comments of US Tire Manufacturers Association and Tire and Rubber Association of Canada*. California Energy Commission. Docket Number: 20-TIRE-01. March 23. pp. 1-46.

Chapter 6

Organizations/Persons Consulted and Preparers/Reviewers

6 Organizations/Persons Consulted and Preparers/Reviewers

6.1 Organizations and Persons Consulted in the Preparation of the EIR

6.1.1 Organizations

California Air Resources Board

California Department of Resources Recycling and Recovery (CalRecycle)

California Department of Toxic Substances Control

6.2 EIR Preparers and Reviewers

6.2.1 California Energy Commission

Bill Blackburn, Energy Resources Specialist III

Julie Burbridge, Program Manager

Taylor Marvin, Special Projects Unit Supervisor

6.2.2 Aspen Environmental Group

Jon Davidson, EIR Project Manager

Britta McOmber, EIR Deputy Project Manager

Brewster Birdsall, PE, QEP, Senior Engineer

Collin Crawford-Martin, Environmental Scientist

Lindsay Griffin, Senior Biologist

Nader Kahlil, Environmental Planner

Irene Kaufman, Environmental Planner

Appendix A

Initial Study

Replacement Tire Efficiency Program

Initial Study

Assembly Bill (AB) 844 (Nation, Chapter 645, Statutes of 2003) requires the California Energy Commission (CEC) to develop and maintain a Replacement Tire Efficiency Program (RTEP) under Public Resources Code sections 25770–25773. Pursuant to PRC sections 25770–25773, the program is designed to ensure that replacement tires sold in California are at least as energy efficient, on average, as original equipment (OE) tires on new passenger vehicles and light-duty trucks. In accordance with directives of PRC sections 25770–25773, the primary objective of the RTEP is to establish a program designed to ensure that replacement tires sold in the state of California are at least as energy efficient, on average, as the tires sold in the state as original equipment on these vehicles. In furtherance of this objective, PRC sections 25770–25773 direct the CEC to:

- Develop a database of the energy efficiency of a representative sample of replacement tires sold in the state, based on test procedures adopted by the CEC.
- Develop a rating system for the energy efficiency of replacement tires sold in the state, that will enable consumers to make more informed decisions when purchasing tires or their vehicles.
- Establish requirements for tire manufacturers to report to the CEC the energy efficiency of replacement tires sold in the state.
- Develop and adopt minimum energy efficiency standards for replacement tires that are technically feasible and cost effective, do not adversely affect tire safety, do not adversely affect the average life of replacement tires, and do not adversely affect state efforts to manage scrap tires.

The proposed RTEP seeks to improve the energy efficiency of replacement tires through the establishment of minimum performance standards, as well as a consumer-focused efficiency rating system, for replacement tires for passenger cars and light-duty trucks sold in California, and to the extent possible ensure that they are at least as energy-efficient as the tires sold as original equipment tires on new vehicles. The proposed minimum standards would apply to the sale of new replacement tires starting with those sold on or after January 1, 2028, with a more stringent level coming into effect three years later in January 1, 2031 (referred to as Phase I and Phase II, respectively). The rolling resistance minimum performance standards proposed by CEC staff are differentiated by tire-product class, reflecting the different performance attributes of different tires.

In its role as lead agency under the California Environmental Quality Act (CEQA), the CEC conducted a preliminary review of the proposed RTEP to assess its potential to

result in significant environmental impacts.[1] The CEC retained Aspen Environmental Group to conduct the preliminary environmental review of the proposed RTEP using the environmental checklist form provided in Appendix G of the State CEQA Guidelines. Based on this review, the CEC staff has determined that the RTEP would not cause significant impacts associated with the environmental topics in the environmental checklist. For each of those environmental topics, this Initial Study provides a brief statement of the reasons for concluding that the RTEP would not result in significant environmental impacts. However, this Initial Study also concludes that some potential exists for significant environmental impacts relating to the following environmental checklist topics:

- Air Quality
- Biological Resources
- Hazardous Materials
- Solid Waste

At the direction of the CEC, Aspen Environmental Group assisted in preparing an environmental impact report (EIR) for the proposed RTEP focused on the environmental topics listed above. A full description of the RTEP is provided in Chapter 2, *Project Description*, of the EIR and is not repeated here.

Although this Initial Study focuses on the project's potential to result in significant adverse impacts on the environment, the RTEP would provide multiple environmental benefits related to fuel efficiency and associated reductions in greenhouse gas emissions and air pollutant emissions. Those benefits are summarized in Section 3.5 of the EIR.

[1] 14 CCR § 15063(a).

A.1 Aesthetics

This section describes the project's environmental setting and discusses potential aesthetic impacts on the existing landscape associated with adoption of the RTEP. This program focuses on improving the energy efficiency of replacement tires through minimum standards for replacement tires for passenger cars and light-duty trucks sold in California.

Visual resources are typically evaluated for the potential impacts on visual character (cityscape or open space, undeveloped or urbanized, area topography, land uses of the area) in the area of the project's effect and from key observation points. Lands within the area of affect controlled by the local, state, or federal government are subject to plans, policies, regulations, or standards that apply to visual resources management (e.g., state scenic highway program, general plans, zoning ordinances).

The proposed RTEP does not involve any direct physical consequences (i.e., new buildings, infrastructure) that would create visual changes in California. The RTEP also would not have an indirect effect on aesthetics since there are no foreseeable consequences of the RTEP that would affect existing landscapes, especially considering that no tire manufacturing currently exists in California. Under the RTEP, businesses that sell or service tires could continue to do so and would not need to change or expand their infrastructure. For these reasons, the RTEP would have no potential to contribute to cumulative effects related to aesthetics.

AESTHETICS Except as provided in Public Resources Code Section 21099, would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☒
b. Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?	☐	☐	☐	☒
c. In non-urbanized areas, substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?	☐	☐	☐	☒
d. Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, aesthetics.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project have a substantial adverse effect on a scenic vista?

No Impact. The RTEP would establish energy efficiency standards for replacement tires that would be applicable statewide in California. It is a proposed regulatory program, and it does not have a physical site location. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that have the potential to affect scenic vistas. No impact would occur.

b. Would the project substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a State scenic highway?

No Impact. The RTEP is a proposed regulatory program that would not include any new buildings or infrastructure in California. As a regulatory program, it does not have a physical site location. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that have the potential to affect scenic resources.

c. In non-urbanized areas, would the project substantially degrade the existing visual character or quality of public views of the site and its surroundings? (Public views are those that are experienced from publicly accessible vantage point). If the project is in an urbanized area, would the project conflict with applicable zoning and other regulations governing scenic quality?

No Impact. The RTEP is a proposed regulatory program; therefore, it does not have a physical site location or physical buildings or infrastructure to view. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that have the potential to degrade visual character or quality of public views.

d. Would the project create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?

No Impact. The implementation of the RTEP would have no foreseeable physical consequences in the environment that have the potential to affect or create a source of light or glare.

A.2 Agriculture and Forestry Resources

This section describes the project's environmental setting and discusses potential impacts to agriculture and forestry resources associated with adoption of the RTEP. This program focuses on improving the energy efficiency of replacement tires through

minimum standards for replacement tires for passenger cars and light-duty trucks sold in California.

The agriculture and forestry resources analysis focuses on potential conversion of agriculture and forestry resources to non-agricultural and non-forestry uses. Agricultural elements in general plans, agricultural zoning ordinances, and conservation easements are considered. Specifically, effects on Williamson Act lands and Timberland Production Zones are considered.

The proposed project does not involve the use of land, including agriculture and forestry, in California. The RTEP regulations are focused on regulation of a specific commercial product, and those regulations do not attempt to control or influence the use of agriculture and forestry resources in California. The RTEP also would not have an indirect effect on agriculture and forestry resources because there are no foreseeable impacts of the RTEP that would affect existing agricultural or forestry land in the state, especially considering that no tire manufacturing currently exists in California. For these reasons, the RTEP would not contribute to cumulative effects related to agriculture or forestry.

AGRICULTURE AND FORESTRY In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Dept. of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Would the project Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☒
b. Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☒

AGRICULTURE AND FORESTRY In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. In determining whether impacts to forest resources, including timberland, are significant environmental effects, lead agencies may refer to information compiled by the California Dept. of Forestry and Fire Protection regarding the state's inventory of forest land, including the Forest and Range Assessment Project and the Forest Legacy Assessment Project; and forest carbon measurement methodology provided in Forest Protocols adopted by the California Air Resources Board.	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
c. Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?	☐	☐	☐	☒
d. Would the project result in the loss of forest land or conversion of forest land to non-forest use?	☐	☐	☐	☒
e. Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, agriculture and forestry resources.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?

No Impact. The RTEP is a proposed regulatory program; therefore, it does not have a physical site location. Because the RTEP does not involve any construction, there would be no land conversion. The implementation of the RTEP would have no

foreseeable physical consequences in the environment that have the potential to result in the conversion of farmland. No impact would occur.

b. Would the project conflict with existing zoning for agricultural use, or a Williamson Act contract?

No Impact. California Planning and Zoning Law codified in California Government Code, section 65000 et seq. provides that "…each county and city shall adopt a comprehensive, long term general plan for the physical development of the county or city, and of any land outside its boundaries…" (Gov. Code, § 65300). Counties and cities may adopt ordinances that regulate use of buildings, structures, and land; location, height, bulk, number of stories, and size of buildings and structures; the percentage of a lot which may be occupied by a building or structure; the size and use of lots, yards, courts, and other open spaces; the intensity of land use; signs and billboards (Gov. Code, § 62850).

California Land Conservation Act of 1965, as amended, enables local governments to enter contracts with private landowners for the purpose of restricting specific parcels of land to agricultural or related open space use. Landowners receive substantially reduced property tax assessments in return for enrollment under a contract. The RTEP is a proposed regulatory program; therefore, it does not have a physical site location. There would be no new structures built in California as a result, and land use in California would not change. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that have the potential to conflict with agricultural zoning or Williamson Act contracts. No impact would occur.

c. Would the project conflict with existing zoning for, or cause rezoning of, forest land (as defined in Public Resources Code section 12220(g)), timberland (as defined by Public Resources Code section 4526), or timberland zoned Timberland Production (as defined by Government Code section 51104(g))?

No Impact. Section 12220(g) of the Public Resources Code defines forest land as land that can support 10 percent native tree cover of any species, including hardwoods, under natural conditions, and that allows for management of one or more forest resources, including timber, aesthetics, fish and wildlife, biodiversity, water quality, recreation, and other public benefits. "Timberland" is land owned by the federal government and designated by the State Board of Forestry and Fire Protection as experimental forest land, which is available for, and capable of, growing a crop of trees of a commercial species used to produce lumber and other forest products, including Christmas trees. Government Code section 51104(g) defines "Timberland Production Zone" (TPZ) as land used for growing and harvesting timber and compatible uses.

The RTEP is a proposed regulatory program; therefore, it does not have a physical site location. There would be no new structures built in California as a result, and land use in California would not change. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that have the potential to conflict with zoning for timberland. No impact would occur.

d. Would the project result in the loss of forest land or conversion of forest land to non-forest use?

No Impact. The RTEP is a proposed regulatory program; therefore, it does not have a physical site location. There would be no change of land use, and thus there would be no land conversion of forest. The implementation of the RTEP would have no foreseeable physical consequences in the environment that have the potential to result in the loss or conversion of forest land. No impact would occur.

e. Would the project involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland to non-agricultural use or conversion of forest land to non-forest use?

No Impact. As stated above, the RTEP would not involve any changes to existing land use, and, as such, would not convert Farmland or forest land. No impact would occur.

A.3 Air Quality

The analysis of air quality focuses on the potential for a project to create conflicts with applicable air quality plans or cause potential increases of air pollutant emissions or pollutant concentrations that pose health risks to the public. For the proposed RTEP, the primary consideration is whether the regulation of replacement tire efficiency could lead to any changes in transportation fuel use by vehicles, which could increase exhaust emissions, or changes in tire wear, that could lead to increasing particulate matter emissions in California. There is no tire manufacturing in California, so air quality impacts associated with tire manufacturing are not considered here.

Because the RTEP is a program of regulations focused on the rolling efficiency of replacement tires, the program of regulations could directly or indirectly affect the use of transportation fuels and the associated exhaust emissions or tire wear emissions. Indirect effects on the use of transportation fuel are expected to be beneficial because the improved efficiency of replacement tires will improve fuel economy for passenger vehicles and light-duty trucks, thereby reducing the use of fuel for such vehicles. This improved fuel economy will also reduce air pollutant emissions from the operation of passenger cars and light-duty trucks. The potential for indirect adverse effects related to air quality is minimal as the RTEP regulations are unlikely to cause any substantive increases fuel use or tire wear.

As discussed at the beginning of Chapter 3 of the EIR, the driving habits of Californians are not expected to change due to the RTEP, and no change is expected in the number of miles driven on California's roads due to the implementation of the RTEP. The RTEP also does not propose any physical changes to the environment that could create new sources of air pollution.

Out of an abundance of caution, the CEC staff has decided to discuss the potential increases of air pollutant emissions. This potential impact is discussed in Section 3.3, *Air Quality*, of the EIR.

AIR QUALITY Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☒
b. Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?	☒	☐	☐	☐
c. Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☒
d. Result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, air quality.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project conflict with or obstruct implementation of the applicable air quality plan?

No Impact. The RTEP is a proposed regulatory program for improving the energy efficiency of replacement tires. By resulting in fuel efficiency improvements, the RTEP would facilitate the CARB mandate (California Health & Safety Code section 43018(a)) to achieve a maximum degree of emission reduction possible from vehicular and other mobile sources. Therefore, the RTEP would not cause a negative impact related to implementation of the California State Implementation Plan (SIP) or other applicable air quality management plans developed by local air districts.

b. Would the project result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard?

This topic has been carried forward for discussion in the EIR. Please see the discussion in EIR Section 3.3, *Air Quality.*

c. Would the project expose sensitive receptors to substantial pollutant concentrations?

No Impact. The proposed RTEP regulations would not include any provisions that would expose sensitive receptors to substantial pollutant concentrations. Implementation and compliance actions associated with the RTEP would not directly or indirectly expose sensitive receptors to substantial pollutant concentrations. Therefore, there would be no impact from the RTEP related to exposing sensitive receptors to substantial pollutant concentrations.

d. Would the project result in other emissions (such as those leading to odors) adversely affecting a substantial number of people?

No Impact. The proposed RTEP regulations would not include any provisions that would cause other emissions such as odors. Implementation and compliance actions associated with the RTEP would not directly or indirectly cause other emissions such as odors. Therefore, there would be no impact from the RTEP related to exposing sensitive receptors to substantial pollutant concentrations.

A.4 Biological Resources

Biological resources, including wildlife, vegetation, and habitat, are discussed in detail in Section 3.4, *Biological Resources*, of the EIR. Section 3.4 discusses effects on biological resources in California in relation to potential impacts that might be considered significant based on the significance thresholds contained in Appendix G of the State CEQA Guidelines. However, the RTEP does not have the potential to result in impacts related to some of the significance thresholds in Appendix G. For those thresholds, the CEC staff's conclusion is that the RTEP would have "No Impact" and, therefore, impacts related to those thresholds are not discussed in Section 3.4.

The reasoning for the determination that the RTEP does not have the potential to result in impacts related to certain CEQA significance thresholds is provided below. Specifically, the RTEP does not have the potential to produce impacts related to the significance thresholds presented in rows d, e, and f in the table below.

BIOLOGICAL RESOURCES Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
b. Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?	☒	☐	☐	☐
c. Have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☒	☐	☐	☐
d. Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of wildlife nursery sites?	☐	☐	☐	☒
e. Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☒
f. Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Communities Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, biological resources.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

This topic has been carried forward for discussion in the EIR. Please see the discussion in EIR Section 3.4, *Biological Resources.*

b. Would the project have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, and regulations or by the California Department of Fish and Wildlife or U.S. Fish and Wildlife Service?

This topic has been carried forward for discussion in the EIR. Please see the discussion in EIR Section 3.4, *Biological Resources.*

c. Would the project have a substantial adverse effect on state or federally protected wetlands (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?

This topic has been carried forward for discussion in the EIR. Please see the discussion in EIR Section 3.4, *Biological Resources.*

d. Would the project interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of wildlife nursery sites?

No Impact. The RTEP is a regulatory program and would not make any direct or indirect change to the environment. The RTEP does not have a physical site location and does involve any type of construction or demolition, and it would not have the potential to cause any direct impact on the physical environment. Therefore, the RTEP would not interfere with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors or impede the use of wildlife nursery sites.

Studies have shown that during rain events runoff containing tire chemicals can enter lakes, rivers, streams and wetlands. These chemicals can accumulate and potentially disrupt wildlife nursery sites that can lead to acute toxicity for some aquatic species. This includes 6PPD-Q which causes pre-spawn mortality in coho salmon (Tian et al. 2021, 2022).

Although this phenomenon is occurring, the amount of 6PPD used in tire rubber is not expected to change as a result of the RTEP regulations because the use of 6PPD does not affect the rolling resistance of tires. 6PPD helps keep tire rubber from degrading but it does not have a role in reducing rolling resistance. (Please see the discussion in Section 3.2.3.2 of the EIR.) Therefore, tire manufacturers would have no reason to change the amount of 6PPD in tires to conform to the RTEP regulations; the RTEP will have no effect on the use of 6PPD in tires because its use is unrelated to rolling resistance and wet grip braking performance (traction).

Further, the RTEP has been designed so that compliant replacement tires do not wear out faster on average than (see Section 2.4*, Project Characteristics*). This will be achieved primarily through the application of RRC minimum performance

standards for different categories of replacement tires, along with a relative wet grip braking performance index performance standard of 1.0. These standards will constrain traction tradeoffs while ensuring the RRC efficiency standards for replacement tires are met without sacrificing tread depth (which is related to wear). A replacement tire with reduced tread depth (i.e., less traction; or a wet grip index value below 1.0) would initially have a lower RRC, but would wear out faster and have to be replaced more frequently. This would result in an increase in TWPs. This balancing of efficiency, tread life, and wet grip braking performance (traction) will ensure that replacement tires can continue to be long lasting, while also being more energy efficient.

Since no increase in the generation of TWPs is expected, there would be no increase in the release of 6PPD into the environment. Therefore, the regulations implemented under the RTEP would not interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors or impede the use of wildlife nursery sites.

e. Would the project conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?

No Impact. The RTEP would not conflict with any local policies or ordinances protecting biological resources. The RTEP would not make any direct or indirect change to the environment because the RTEP is a regulatory program. The RTEP will set forth regulations and standards which pertain to replacement tires and their efficiency; however, these regulations and standards for tire efficiency will not conflict with local watershed plans, tree preservation policies or ordinances protecting biological resources.

The amount of 6PPD used in tire rubber tires, which is known to cause acute toxicity for some aquatic species is not expected to change as a result of the RTEP regulations because the use of 6PPD does not affect the rolling resistance of tires. 6PPD helps keep tire rubber from degrading but it does not have a role in reducing rolling resistance. Therefore, tire manufacturers would have no reason to change the amount of 6PPD in tires to conform to the RTEP regulations. The regulations implemented under the RTEP would not conflict with any local policies or ordinances protecting biological resources. There would be no impact.

f. Would the project conflict with the provisions of an adopted Habitat Conservation Plan, Natural Communities Conservation Plan, or other approved local, regional, or state habitat conservation plan?

No Impact. The RTEP would not conflict with any provisions of an adopted Habitat Conservation Plan, Natural Communities Conservation Plan, or approved local, regional, or state habitat conservation plan. The RTEP is a regulatory program and will set forth regulations and standards which pertain to replacement tires and their efficiency; however, these regulations and standards for tire efficiency will not

conflict with any previously adopted Habitat Conservation Plan, Natural Communities Conservation Plan, or approved local, regional, or state habitat conservation plan. Therefore, no impact would occur.

A.5 Cultural and Tribal Cultural Resources

This section evaluates the potential environmental impacts of the proposed RTEP, a program focusing on improving the energy efficiency of replacement tires through minimum standards for passenger cars and light-duty trucks sold in California, to potentially affect or cause a substantial adverse change to cultural and tribal cultural resources in California.

A cultural resource is defined as any object or specific location of past human activity, occupation, or use, identifiable through historical documentation, inventory, or oral evidence. Cultural resources can be separated into three categories: archaeological, built environment, and tribal cultural resources.

The proposed RTEP is a regulatory program that does not have a physical site location. Accordingly, it does not involve any direct physical consequences requiring construction of new buildings or infrastructure, and/or alterations to existing buildings or infrastructure, and it would not include any surface or subsurface alterations to soil in California. It would also not affect or create visual changes to existing landscapes, especially considering that no tire manufacturing currently exists in California, and that businesses that sell or service tires could continue to do so and would not need to change or expand their infrastructure to do so. As a result, implementation of the RTEP would have no foreseeable potential to impact, affect, or cause a substantial adverse change to archaeological, built environment, or tribal cultural resources in California, either directly or indirectly. For these reasons, the RTEP would have no potential to contribute to cumulative effects related to cultural resources.

CULTURAL AND TRIBAL CULTURAL RESOURCES	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Would the project cause a substantial adverse change in the significance of a historical resource pursuant to § 15064.5?	☐	☐	☐	☒
b. Would the project cause a substantial adverse change in the significance of a unique archaeological resource pursuant to § 15064.5?	☐	☐	☐	☒
c. Would the project disturb any human remains, including those interred outside of dedicated cemeteries?	☐	☐	☐	☒
d. Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a				

CULTURAL AND TRIBAL CULTURAL RESOURCES	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:				
i. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or	☐	☐	☐	☒
ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, cultural resources and tribal cultural resources.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project cause a substantial adverse change in the significance of a historical resource pursuant to State CEQA Guidelines section 15064.5?

No Impact. The proposed RTEP is a regulatory program that has no physical site location and would not have any direct effect on the physical environment. No ground disturbance is proposed, and no new buildings, structures, objects, and/or infrastructure are proposed nor are there any proposed alterations to existing buildings, structures, objects and/or infrastructure in California. As a result, implementation of the RTEP would have no foreseeable potential to impact, affect, or cause a substantial adverse change in the significance of a historical resource pursuant to State CEQA Guidelines section 15064.5.

b. Would the project cause a substantial adverse change in the significance of a unique archaeological resource pursuant to State CEQA Guidelines section 15064.5?

No Impact. The proposed RTEP is a regulatory program that has no physical site location and would not have any direct effect on the physical environment. No ground disturbance is proposed. As a result, implementation of the RTEP would have no foreseeable potential to impact, affect, or cause a substantial adverse change in the significance of a unique archaeological resource pursuant to State CEQA Guidelines section 15064.5.

c. Would the project disturb any human remains, including those interred outside of dedicated cemeteries?

No Impact. The proposed RTEP is a regulatory program that has no physical site location and would not have any direct effect on the physical environment. No ground disturbance is proposed. Therefore, the RTEP would not disturb any human remains, including those interred outside of dedicated cemeteries.

d. Would the project cause a substantial adverse change in the significance of a tribal cultural resource, defined in Public Resources Code section 21074 as either a site, feature, place, cultural landscape that is geographically defined in terms of the size and scope of the landscape, sacred place, or object with cultural value to a California Native American tribe, and that is:

i. Listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k), or

No Impact. The proposed RTEP is a regulatory program that has no physical site location and would not have any direct effect on the physical environment. No ground disturbance is proposed, no new buildings, structures, objects, and/or infrastructure are proposed, there are no proposed alterations to existing buildings, structures, objects or infrastructure. In addition, the RTEP would not impact or create visual changes to any existing landscapes. As a result, implementation of the RTEP would have no foreseeable physical consequences that have the potential to impact any tribal cultural resource, listed or eligible for listing in the California Register of Historical Resources, or in a local register of historical resources as defined in Public Resources Code section 5020.1(k).

ii. A resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant pursuant to criteria set forth in subdivision (c) of Public Resources Code Section 5024.1. In applying the criteria set forth in subdivision (c) of Public

Resource Code Section 5024.1, the lead agency shall consider the significance of the resource to a California Native American tribe.

No Impact. The proposed RTEP is a regulatory program that has no physical site location and would not have any direct effect on the physical environment. No ground disturbance is proposed, no new buildings, structures, objects and/or infrastructure are proposed, there are no proposed alterations to existing buildings, structures, objects, or infrastructure. In addition, the RTEP would not impact or create visual changes to any existing landscapes. As a result, implementation of the RTEP would have no foreseeable physical consequences that have the potential to impact, a resource determined by the lead agency, in its discretion and supported by substantial evidence, to be significant to a California Native American tribe pursuant to criteria set forth in subdivision (c) of Public Resources Code section 5024.1.

A.6 Energy

The RTEP framework reviews the relationship of California's tire efficiency policy to California's petroleum reduction and climate change policies (PRC sections 25770–25773). This regulation is focused on improving the energy efficiency of replacement tires for passenger cars and light-duty trucks in California by providing a minimum performance standard for rolling resistance.

The energy resources analysis evaluates whether the project would conflict with a state or local plan for renewable energy or energy efficiency, or would result in a potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources during project construction or operation. CEQA requires a discussion of the potential energy impacts of proposed projects where there is a possibility of "wasteful, inefficient, and unnecessary consumption of energy." (See PRC section 21100(b)(3)). Appendix F of the State CEQA Guidelines specifically requires consideration of any potentially significant energy implications of a project and directs lead agencies to adhere to the goal of conserving energy, through the following means:

- decreasing overall per capita energy consumption,
- decreasing reliance on fossil fuels such as coal, natural gas and oil, and
- increasing reliance on renewable energy sources.

The proposed project is a regulatory program that does not have a physical location. There would be no construction, buildings, or infrastructure developed, so no energy resources would be impacted during project construction or operation. The RTEP is expected to have a beneficial impact on energy resources because low-rolling resistance tires are more energy efficient and would reduce the amount of fuel needed to power California's passenger vehicle fleet.

ENERGY Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?	☐	☐	☐	☒
b. Conflict with or obstruct a state or local plan for renewable energy or energy efficiency?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, energy.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project result in potentially significant environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources, during project construction or operation?

No Impact. The RTEP is a proposed regulatory program; therefore, it does not have a physical site location. The RTEP program would provide a method for increasing the efficiency of replacement tires for passenger cars and light-duty trucks, which can be achieved by changing tire specifications and production lines within existing facilities and using existing technologies. There are currently no tire manufacturing plants in California, and the RTEP is not expected to induce new plant construction in the state. Under PRC section 25773(a)(1)(D), the regulation must not increase the amount of scrap tires generated within California, nor negatively impact state efforts to manage scrap tires pursuant to the California Tire Recycling Act. The regulation is not expected to increase tire waste streams or induce construction of new, or expansion of existing, waste tire disposal or recycling infrastructure (see the discussion in Section 3.1.3.2 that shows tire efficiency can be achieved without increasing tire wear). The regulation would not change driving habits or patterns, and thus, would not induce or incentivize infrastructure projects. No construction, buildings or infrastructure will be developed under the regulation, and no related wasteful, inefficient, or unnecessary energy consumption would occur from project construction or operation.

The program would increase the efficiency of replacement tires, which would increase the fuel efficiency of vehicles and reduce the amount of energy resources used by passenger cars and light-duty trucks in the state. Implementation of the RTEP is expected to result in significant energy and fuel savings, including 3.4 million gallons of diesel, 141.1 million gallons of gasoline, 0.9 terawatt-hours of electricity, and 0.5 million kilograms of hydrogen annually by 2035 (see Section 3.5, *Environmental Benefits*.) As a result, the implementation of the RTEP would not

result in an environmental impact due to wasteful, inefficient, or unnecessary consumption of energy resources. No impact would occur.

b. Would the project conflict with or obstruct a state or local plan for renewable energy or energy efficiency?

No Impact. The RTEP is a state regulatory program designed to assist in the state's efforts of achieving the goals articulated in its climate action plans. The RTEP program would provide a method for increasing the efficiency of replacement tires for passenger cars and light-duty trucks, which would increase the fuel efficiency of vehicles and promote energy efficiency by passenger cars and light-duty trucks in the state. These measures would not conflict with or obstruct plans for renewable energy or energy efficiency. No impact would occur.

A.7 Geology and Soils

This section describes the project's potential impacts on geology and soil resources associated with adoption of the RTEP. This program is focused on improving the energy efficiency of replacement tires through minimum standards for replacement tires for passenger cars and light-duty trucks in California.

The geology and soil resources analysis evaluates whether the project would directly or indirectly cause adverse effects, soil erosion, or destruction of unique paleontological or geologic resources due to fault ruptures, seismic ground shaking, liquefaction, landslides, or proximity to unstable and expansive soils. The state requires geotechnical investigations for projects located in areas susceptible to seismic-induced hazards and limits construction within 50 feet of delineated earthquake faults to reduce risks of loss, injury, or death.

The proposed project is a regulatory program that does not have a physical location. There would be no construction, buildings, or infrastructure developed, so fault ruptures, seismic activity, landslides, or liquefaction occurring in the State would have no effect as a result of the RTEP. There would be no land disturbance, and thus no impact to unique geological or paleontological resources. For these reasons, the RTEP would not directly or indirectly cause adverse effects to geology and soil resources.

GEOLOGY AND SOILS Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☒
i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault	☐	☐	☐	☒

GEOLOGY AND SOILS Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.				
ii. Strong seismic ground shaking?	☐	☐	☐	☒
iii. Seismic-related ground failure, including liquefaction?	☐	☐	☐	☒
iv. Landslides?	☐	☐	☐	☒
b. Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☒
c. Be located on geologic units or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?	☐	☐	☐	☒
d. Be located on expansive soil, as defined in Section 1803.5.3 of the California Building Code (2010), creating substantial direct or indirect risks to life or property?*	☐	☐	☐	☒
e. Have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?	☐	☐	☐	☒
f. Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, geology and soils and minerals. *****Geology and Soils question (d) reflects the current 2022 California Building Code (CBC), effective January 1, 2023, which is based on the International Building Code (2021).

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project directly or indirectly cause potential substantial adverse effects, including the risk of loss, injury, or death involving:

i. Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.

No Impact. The RTEP is a proposed regulatory program; therefore, it does not have a physical site location. The proposed project would require tire manufacturers to produce more energy efficient replacement tires, which can be achieved by changing tire specifications and production lines within existing facilities and using existing technologies. There are currently no tire manufacturing plants in California, and the RTEP is not expected to induce new plant construction in the state. Under PRC sections 25770–25773, the regulation must not increase the amount of scrap tires generated within California, nor negatively impact state efforts to manage scrap tires pursuant to the California Tire Recycling Act; thus, the regulation is not expected to increase tire waste streams or induce construction of new, or expansion of existing, waste tire disposal or recycling infrastructure. The program would not change driving habits or patterns, and thus, would not induce or incentivize infrastructure projects. No construction, buildings or infrastructure will be developed under the regulation, and no related land disturbance would occur; no structures would be located near a fault. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in adverse effects related to rupture of a known earthquake fault.

ii. Strong seismic ground shaking?

No Impact. The RTEP is a proposed regulatory program that does not have a physical site location. As explained above, no construction, buildings or infrastructure will be developed under the regulation, and no related land disturbance would occur. Therefore, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in adverse effects related to strong seismic ground shaking.

iii. Seismic-related ground failure, including liquefaction?

No Impact. The RTEP is a proposed regulatory program that does not have a physical site location. As explained above, no construction, buildings or infrastructure will be developed under the regulation, and no related land disturbance would occur. Therefore, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in adverse effects related to seismic-related ground failure or liquefaction.

iv. Landslides?

No Impact. The RTEP is a proposed regulatory program that does not have a physical site location. As explained above, no construction, buildings or infrastructure will be developed under the regulation, and no related land disturbance would occur. Therefore, the implementation of the RTEP would

have no foreseeable physical consequences in the environment that would result in adverse effects related to landslides.

b. Would the project result in substantial soil erosion or the loss of topsoil?

No Impact. The RTEP is a proposed regulatory program that does not have a physical site location. As explained above, no construction, buildings or infrastructure will be developed under the regulation, and no related land disturbance would occur. Therefore, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in adverse effects related to soil erosion or the loss of topsoil.

c. Would the project be located on geologic units or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction, or collapse?

No Impact. The RTEP is a proposed regulatory program that does not have a physical site location. As explained above, no construction, buildings or infrastructure will be developed under the regulation, and no related land disturbance would occur. No structures would be located on geologic units or soil that is unstable or could become unstable as a result of the project. Therefore, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in adverse effects related to unstable soils.

d. Would the project be located on expansive soil, as defined in Section 1803.5.3 of the California Building Code (2010), creating substantial direct or indirect risks to life or property?

No Impact. The RTEP is a proposed regulatory program that does not have a physical site location. As explained above, no construction, buildings or infrastructure will be developed under the regulation, and no related land disturbance would occur. No structures would be located on unstable geologic units or expansive soil units. Therefore, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in adverse effects related to expansive soils.

e. Would the project have soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems where sewers are not available for the disposal of wastewater?

No Impact. The RTEP is a proposed regulatory program that does not have a physical site location. As explained above, no construction, buildings or infrastructure will be developed under the regulation, and no related land disturbance would occur. No project activities would be located on soils incapable of adequately supporting the use of septic tanks or alternative wastewater disposal systems. Therefore, the implementation of the RTEP would have no foreseeable

physical consequences in the environment that would result in adverse effects related to wastewater disposal.

f. Would the project directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?

No Impact. The RTEP is a proposed regulatory program that does not have a physical site location. As explained above, no construction, buildings or infrastructure will be developed under the regulation, and no related land disturbance would occur. No project activities would directly or indirectly destroy a unique paleontological resource or geologic feature. Therefore, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in adverse effects related to paleontological and geological resources.

A.8 Greenhouse Gas Emissions

Greenhouse gas (GHG) emissions contribute to the public health and environmental concern of global climate change. Global warming associated with the "greenhouse effect" is a process whereby GHGs accumulating in the atmosphere contribute to an increase in the temperature of the atmosphere. The anthropogenic pollutants that contribute to global warming and climate change include carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), black carbon, and fluorinated gases (F-gases). These GHGs are attributable in large part to anthropogenic, or human, activities associated with transportation, industrial/manufacturing, utility, residential, commercial, and agricultural sectors (CARB 2022).

Fuel use by the transportation sector (primarily on-road travel) is the single largest source of CO_2 emissions in the state (CARB 2022). Because use of transportation fuels by passenger cars and trucks is a major contributor of GHG emissions in the state, reducing the demand for fossil transportation fuels and making efficiency improvements are key components in California's strategy to reduce GHG emissions and the risks associated with climate change. In addition to vehicle exhaust emissions, the production and distribution of transportation fuels cause "upstream" GHG emissions. Extraction of the fuel feedstock, usually petroleum, transportation of the feedstock, refining into finished products, and transporting the finished fuel to distribution facilities are activities that cause "upstream" GHG emissions (Blackburn et al. 2026, Chapter 9).

Table A.8-1 summarizes the statewide GHG emissions inventory by sector (CARB 2024a), including subcategories within the transportation and the industrial sectors, according to the categories of sources defined in the CARB's Scoping Plan (CARB 2022).

Table A.8-1: California GHG Emissions Summary (million metric tons of carbon dioxide equivalent)

Statewide, Sector and Subcategory	2017	2020	2022
Transportation Sector	---	---	---
On Road	---	---	---
Passenger Vehicles	117.5	94.1	102.5
Heavy Duty Vehicles	37.8	32.0	27.4
Ships & Commercial Boats	3.6	3.8	3.8
Aviation	4.4	2.7	3.9
Rail	1.3	1.4	1.1
Unspecified	1.4	1.2	1.1
Industrial Sector	---	---	---
Off Road	2.0	2.0	1.8
Refineries and Hydrogen Production	30.2	25.8	26.2
General Fuel Use	12.4	11.6	11.9
Oil & Gas: Production & Processing	15.5	12.9	11.9
Cement Plants	7.7	7.5	7.4
Cogeneration Heat Output	6.1	6.2	5.7
Other Fugitive and Process Emissions	7.9	7.8	7.8
Electric Power	---	---	---
In-State Generation	40.4	40.9	42.2
Imported Electricity	23.9	18.6	17.5
Commercial and Residential Sector	---	---	---
Residential Fuel Use	24.0	25.4	24.7
Commercial Fuel Use	12.4	11.7	13.0
Commercial Cogeneration Heat Output	0.5	0.4	0.4
Other Commercial and Residential	1.4	1.4	1.4
Agriculture Sector	---	---	---
Livestock	22.8	22.2	20.9
Crop Growing & Harvesting	6.6	6.8	6.8
General Fuel Use	2.3	2.4	2.2
High Global-Warming Potential Substances	20.1	21.3	21.3
Recycling and Waste	8.2	8.5	8.2
Total California Inventory Emissions	**410.3**	**368.5**	**371.1**

Source: CARB, 2024a. Inventory by Scoping Plan Category, updated 9/20/2024.

Black carbon is a GHG pollutant of airborne carbonaceous particles, and it acts as an absorber of visible solar radiation in the atmosphere. Black carbon contributes to climate change both directly by absorbing sunlight and indirectly by depositing on snow and by interacting with clouds and affecting cloud formation. Airborne particulate

matter is a human health and climate concern emitted from a variety of sources and processes, including tire and road wear, black carbon is emitted from burning fuels such as coal, diesel, and biomass, as well as from various forms of non-fuel biomass combustion (destruction of excess woody wastes, wildfires, etc.). California's strategy for reducing emissions from transportation sources of black carbon relies on controlling and lowering exhaust-related emissions, especially diesel particulate matter (CARB 2017). On-road brake and tire wear make up about four percent of California's black carbon emissions (CARB 2015).

GREENHOUSE GAS EMISSIONS Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☐	☒
b. Conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, greenhouse gas emissions.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?

No Impact. The RTEP is a proposed regulatory program for improving the energy efficiency of replacement tires. The objectives of the RTEP include achieving increased fuel economy by reducing rolling resistance. With the RTEP, less gasoline for combustion vehicles and less electricity for electric vehicles (or other fuels, such as diesel, hydrogen, etc.) would be needed to power the California passenger vehicle fleet. The CEC staff estimates the potential annual reduction in emissions to be 2.0 million metric tons (MMT) of carbon dioxide equivalent (CO_2e) in 2035, assuming a 90 percent compliance rate with the proposed project (Blackburn et al. 2026, Chapter 9).

The RTEP design ensures that the program would not increase GHG emissions related to fuel use in the transportation sector. The RTEP is also designed to avoid increasing tire wear for replacement tires, and this ensures that the program would avoid causing a black carbon emissions increase due to tire wear. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in an increase in GHG emissions at a level that could have a significant impact on the environment.

b. Would the project conflict with an applicable plan, policy or regulation adopted for the purpose of reducing the emissions of greenhouse gases?

No Impact. The RTEP is a state regulatory program designed to assist in the state's efforts of achieving the goals articulated in its climate action plans. The RTEP program would provide a method for increasing the efficiency of replacement tires for passenger cars and light-duty trucks. The program would increase the efficiency of replacement tires, which would increase the fuel efficiency of vehicles and reduce the amount of GHG emitted by passenger cars and light-duty trucks in the state. These measures would be consistent with CARB's Scoping Plan to reduce GHG emissions and other harmful air pollutants, while also reducing fuel usage. No impact would occur.

A.9 Hazards and Hazardous Materials

The hazards and hazardous materials analysis focuses on the potential for a project to create significant hazards to the public or the environment through the routine transport, use, disposal, or accidental release of hazardous materials. It also considers a project's potential to interfere with emergency response plans or to expose people to wildfire risks. For the proposed RTEP, the primary consideration is whether the regulation of replacement tire efficiency could lead to any changes in the use, transport, disposal, or release of hazardous materials associated with tires in California. There is no tire manufacturing in California, so hazardous materials associated with tire manufacturing are not considered here.

Hazardous substances associated with tires are discussed in detail in Section 3.2, *Hazardous Materials*. Tires are not considered a hazardous substance, although they do contain compounds that are considered detrimental if released into the environment. Such compounds primarily enter the environment via rubber particles generated through tire wear. Rubber particles can be suspended in the air and contribute to particulate air pollution. They can also settle onto the ground and be washed into watercourses, thereby contributing to water pollution. The effects of rubber particulates from tires on air quality are discussed in Section 3.3, *Air Quality*, and effects on aquatic life and water quality are discussed in Section 3.4, *Biological Resources*, and Section A.10, *Hydrology and Water Quality*, respectively.

Because the RTEP is a program of regulations focused on the rolling efficiency of replacement tires, it has little potential to directly affect the routine transport, use, disposal, or accidental release of any hazardous materials. The potential for indirect effects related to hazardous substances is minimal as the RTEP regulations are unlikely to cause any substantive changes in tire transport, use, or disposal. As discussed at the beginning of Chapter 3 of the EIR, the driving habits of Californians are not expected to change due to the RTEP and no change is expected in the number of miles driven on California's roads due to the implementation of the RTEP. The RTEP also does not propose any physical changes to the environment that could create new hazards or exacerbate existing ones.

Although the RTEP does not mandate any changes to the chemical constituents of tire rubber, the CEC staff acknowledges that tire rubber contains various chemical compounds that present concerns for the environment and human health. Out of an abundance of caution, the CEC staff has decided to discuss the potential for indirect effects from the transmission of hazardous substances contained in tires into the environment. This potential impact is discussed in Section 3.2, *Hazardous Materials*.

HAZARDS AND HAZARDOUS MATERIALS	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☒	☐	☐	☐
b. Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☐	☒
c. Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☒
d. Would the project be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☒
e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?	☐	☐	☐	☒
f. Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
g. Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, hazards and hazardous materials.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?

This topic has been carried forward for discussion in the EIR. Please see the discussion in EIR Section 3.2, *Hazardous Materials.*

b. Would the project create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?

No Impact. The RTEP is a statewide regulatory program that does not involve any activities that could lead to the accidental release of hazardous materials into the environment. The program's focus on tire efficiency does not affect the potential for accidents or upset conditions involving hazardous materials. Therefore, there would be no impact related to the accidental release of hazardous materials.

c. Would the project emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?

No Impact. The RTEP is a statewide regulatory program that does not involve the emission or handling of hazardous materials. It does not propose any physical development or changes to existing facilities that could result in hazardous emissions near schools. Therefore, there would be no impact related to hazardous emissions or materials near schools.

d. Would the project be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?

No Impact. The RTEP is a statewide regulatory program that is not associated with any specific physical location. It does not involve development on any sites, including those listed as hazardous materials sites. Therefore, there would be no impact related to hazardous materials sites.

e. For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard or excessive noise for people residing or working in the project area?

No Impact. The RTEP is a statewide regulatory program that is not associated with any specific location, including areas near airports. It does not involve any physical

development or changes that could affect airport safety or noise exposure. Therefore, there would be no impact related to airport hazards or noise.

f. Would the project impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?

No Impact. The RTEP is a statewide regulatory program that does not involve any physical changes to the environment or alterations to the transportation network that could interfere with emergency response or evacuation plans. The program's focus on tire efficiency would not affect the implementation of such plans. Therefore, there would be no impact on emergency response or evacuation plans.

g. Would the project expose people or structures, either directly or indirectly, to a significant risk of loss, injury or death involving wildland fires?

No Impact. The RTEP is a statewide regulatory program that does not involve any physical development or changes to land use that could affect wildfire risk. The program's focus on tire efficiency would not increase exposure to wildfire hazards. Therefore, there would be no impact related to wildland fire risks.

A.10 Hydrology and Water Quality

The hydrology and water quality analysis focuses on a project's potential impacts on surface water and groundwater resources, including water quality, water supply, drainage patterns, and flood hazards. For the proposed RTEP, the primary consideration is whether the regulation of replacement tire efficiency could indirectly lead to any changes that would adversely affect water resources in California.

Tire wear particles, which are generated as tires degrade during use, can contribute to water pollution. These particles contain various compounds, including rubber, fillers, and additives, which can be washed into storm drains and waterways during rainfall events. Once in aquatic environment, these particles can degrade water quality, which has the potential to adversely affect aquatic ecosystems and organisms. The RTEP focuses on the rolling efficiency of replacement tires and does not mandate any changes to the composition of tire rubber. However, the CEC staff acknowledges that tire rubber particles contain various chemical compounds that present concerns for water quality and the environment. Therefore, the hazardous substances contained in tire rubber are discussed in detail in Section 3.2, *Hazardous Materials*, and potential effects on the aquatic environment are discussed in detail in Section 3.4, *Biological Resources*.

Based on a review of the proposed RTEP and its potential direct and indirect effects, there is no substantial evidence that the proposed regulations would have the potential to cause significant impacts to hydrology or water quality. The RTEP is a regulatory program focused on improving the energy efficiency of replacement tires for passenger cars and light-duty trucks. It does not involve any physical changes to the environment

or alterations to land use that could directly affect water resources. Moreover, the program's focus on rolling efficiency is not expected to significantly alter tire wear patterns or the generation of tire wear particles in a way that would adversely affect water quality.

HYDROLOGY AND WATER QUALITY Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?	☐	☐	☒	☐
b. Substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?	☐	☐	☐	☒
c. Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or through the addition of impervious surfaces in a manner which would:	☐	☐	☐	☒
i. result in substantial erosion or siltation, on- or offsite;	☐	☐	☐	☒
ii. substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or offsite;	☐	☐	☐	☒
iii. create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff; or	☐	☐	☐	☒
iv. impede or redirect flood flows?	☐	☐	☐	☒
d. In flood hazard, tsunami, or seiche zones, risk release of pollutants due to project inundation?	☐	☐	☐	☒
e. Conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, hydrology and water quality.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project violate water quality standards or waste discharge requirements or otherwise substantially degrade surface or ground water quality?

Less-Than-Significant Impact. Because the RTEP is a regulatory program focused on tire efficiency and does not directly involve any physical changes to the environment, it does not have the potential to directly affect water quality through

the discharge of pollutants. The RTEP does not have a physical location and does not involve any construction and, therefore, would not contribute sediment or pollutants to watercourses through erosion, pollutant spills, or direct discharges. For those same reasons, the RTEP would not affect groundwater quality.

While tires generate tire wear particles that are a contributor to water pollution, the RTEP is designed to not result in any significant change in tire wear. The proposed minimum performance standards for rolling resistance would apply different standards to different types of tires (see Table 2-2) for the purpose of maintaining the desirable performance characteristics of various types of tires, including long-life and ultra-long-life tires. Also, the RTEP does not mandate any changes to the composition of tire rubber, and manufacturers are expected to continue to produce rubber that is suitable for the purposes of each type of tire they manufacture based on propriety formulations. Although tire wear particles will continue to be a source of water pollution, implementation of the RTEP regulations would not alter the generation of tire wear particles in any significant way.

b. Would the project substantially decrease groundwater supplies or interfere substantially with groundwater recharge such that the project may impede sustainable groundwater management of the basin?

No Impact. The RTEP does not involve any activities that would use groundwater or affect groundwater recharge. The program's focus on tire efficiency does not affect groundwater resources. Therefore, there would be no impact on groundwater supplies or recharge.

c. Would the project substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or through the addition of impervious surfaces in a manner which would:

i. result in substantial erosion or siltation, on or off site?

No Impact. The RTEP is a regulatory program focused on tire efficiency and does not directly involve any physical changes to the environment or land use alterations. It does not propose any activities that would affect drainage patterns, soil stability, or erosion potential. The program would not create new impervious surfaces or alter existing surfaces in a way that could lead to increased erosion or siltation. Therefore, there would be no impact related to erosion or siltation.

ii. substantially increase the rate or amount of surface runoff in a manner which would result in flooding on or off site?

No Impact. The RTEP does not involve any physical development or changes to existing land surfaces that could alter surface runoff patterns. The program's focus on tire efficiency would not affect the rate or amount of surface water

runoff. It does not propose any activities that would create new impervious surfaces or modify existing drainage systems in a way that could increase flood risk. Therefore, there would be no impact related to increased surface runoff or flooding.

iii. create or contribute runoff water which would exceed the capacity of existing or planned storm water drainage systems or provide substantial additional sources of polluted runoff? or

No Impact. The RTEP is a regulatory program that does not involve any activities that would generate additional runoff or contribute new sources of polluted runoff. The program's focus on tire efficiency is not expected to significantly alter tire wear patterns or the generation of tire wear particles in a way that would impact stormwater quality. It does not propose any physical changes that would affect the capacity of existing or planned stormwater drainage systems. Therefore, there would be no impact related to stormwater system capacity or polluted runoff.

iv. impede or redirect flood flows?

No Impact. The RTEP does not involve any physical development or changes to the existing landscape that could impede or redirect flood flows. The program's regulations on tire efficiency would not affect floodplains or flood-prone areas. It does not propose any structures or alterations that could affect the direction or flow of flood water. Therefore, there would be no impact related to impeding or redirecting flood flows.

d. In flood hazard, tsunami, or seiche zones, would the project risk release of pollutants due to project inundation?

No Impact. The RTEP is a statewide regulatory program that is not associated with any specific physical location, including areas prone to flooding, tsunamis, or seiches. It does not involve the storage or use of pollutants that could be released during inundation events. Therefore, there would be no impact related to the release of pollutants in flood hazard zones.

e. Would the project conflict with or obstruct implementation of a water quality control plan or sustainable groundwater management plan?

No Impact. As discussed above, the RTEP is not expected to result in any significant change in the generation of tire wear particles, which are an existing source of pollution that affects surface water bodies across the state. While tire wear particles will continue to be a source of water pollution, implementation of the RTEP regulations would not alter the generation of tire wear particles in any significant way. Therefore, the RTEP would not conflict with or obstruct the implementation of any water control plans. As also discussed above, the RTEP is not expected to have an effect on groundwater quality or groundwater supplies and, therefore, would no

conflict with or obstruct the implementation of any sustainable groundwater management plans.

A.11 Land Use and Planning

Land use refers to the utilization of land parcels for various purposes as designated in official plans adopted by city or county governments with jurisdiction over the subject land. Typically, land is designated for various broad categories of use, such as residential, commercial, or industrial uses. For lands controlled by the state or federal government, land use plans adopted by the government agencies responsible for administering those lands establishes land-use policy. Land use also refers to the actual utilization of land, regardless of whether those uses are consistent with current land use policies.

City and county governments in California are required to prepare and adopt policies for land use within their jurisdictions. These policies are described in the land-use element (or its equivalent) of the General Plans adopted by cities and counties in California. Cities and counties also establish regulations, such as zoning, to control and regulate land uses on privately owned land parcels in their jurisdictions. Such regulations must be consistent with the land-use policies articulated in the jurisdiction's adopted General Plan. Other regulations may also influence the use of land, such as state and federal rules and regulations for protection of natural resources and protection from hazards.

The proposed RTEP does not involve the use of land or the regulation of land use in California. The RTEP regulations are focused on the regulation of a specific commercial product (i.e., replacement tires for passenger vehicles and light-duty trucks) and those regulations do not attempt to control or influence the use of land in California or alter established land-use policies. The RTEP also would not have an indirect effect on land use since there are no foreseeable consequences of the RTEP that would affect existing land-use patterns or adopted land-use policies, especially considering that no tire manufacturing currently exists in California. Under the RTEP, businesses that sell or service tires could continue to do so in accordance with applicable land-use policies and ordinances that regulate the use of land. For these same reasons, the RTEP would have no potential to contribute to cumulative effects related to land use or land-use policy.

LAND USE AND PLANNING Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Physically divide an established community?	☐	☐	☐	☒
b. Cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted	☐	☐	☐	☒

LAND USE AND PLANNING Where available, the significance criteria established by the applicable air quality management district or air pollution control district may be relied upon to make the following determinations. Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
for the purpose of avoiding or mitigating an environmental effect?				

Environmental checklist established by State CEQA Guidelines, Appendix G, land use and planning.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project physically divide an established community?

No Impact. The RTEP is a proposed statewide regulatory program and, therefore, it would not have any direct effect on the physical environment. It would also have no foreseeable indirect physical effect on land use as it does not call for or require any changes to existing land-use patterns or land-use policies. With adoption of the RTEP, land use would continue to be controlled by applicable land use policies and regulations established by city and county governments in their General Plans and zoning ordinances. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in the division of an established community.

b. Would the project cause a significant environmental impact due to a conflict with any land use plan, policy, or regulation adopted for the purpose of avoiding or mitigating an environmental effect?

No Impact. The RTEP does not regulate or influence the use of land nor attempt to alter adopted land-use policies. With the RTEP, tire retail and service establishments would continue to be subject to applicable land-use policies and regulations adopted by city and county governments. Similarly, these establishments would continue to be required to comply with all other applicable plans, policies, and regulations, including those adopted for the purpose of avoiding or mitigating environmental effects. Therefore, no impact would occur.

A.12 Mineral Resources

This section describes the project's potential impacts on mineral resources associated with adoption of the RTEP. This program is focused on improving the energy efficiency of replacement tires for passenger cars and light-duty trucks in California through the use of minimum performance standards. The mineral resources analysis evaluates whether implementation of the project would result in the loss of availability of a known mineral resource or locally important mineral resource recovery site. The state uses Mineral Resource Zones (MRZs) to identify areas containing valuable mineral deposits, such as construction aggregates (sand and gravel), metals (gold, silver, iron, and

copper), industrial minerals (boron compounds, clay, limestone, gypsum, and salt), oil, and natural gas. Mineral resource recovery sites include active, closed, reclaimed, or proposed mines and wells.

The proposed project is a regulatory program that does not have a physical location. There would be no construction, buildings, or infrastructure developed, so no locally important mineral resource recovery sites would be impacted. The program would not change driving habits or patterns and is not expected to substantially alter the baseline demand for replacement tires (vehicle tires would still need to be replaced every 3 to 6 years). The RTEP would not result in a loss of availability of a known mineral resource that is of value (i.e., transportation fuels) because low-rolling resistance tires are more energy efficient and would reduce the amount of fuel needed to power California's vehicle fleet. For these reasons, the RTEP would not directly or indirectly cause adverse effects to mineral resources.

MINERALS Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?	☐	☐	☐	☒
b. Result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, minerals.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the State?

No Impact. The RTEP is a proposed regulatory program; therefore, it does not have a physical site location. The proposed project would not change driving habits or patterns and is not expected to substantially alter the baseline demand for replacement tires (vehicle tires would still need to be replaced every 3 to 6 years). Low-rolling resistance tires are more energy efficient, and implementation of the RTEP would reduce the amount of fuel consumed by California's vehicle fleet, thereby preserving the availability of a known mineral resource of value (transportation fuels). As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state.

b. Would the project result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?

No Impact. The RTEP is a proposed regulatory program that does not have a physical site location. The proposed project would require tire manufacturers to produce more energy efficient replacement tires, which can be achieved by changing tire specifications and production lines within existing facilities and using existing technologies. There are currently no tire manufacturing plants in California, and the RTEP is not expected to induce new plant construction in the state. Under PRC sections 25770–25773, the regulation must not increase the amount of scrap tires generated within California, nor negatively impact state efforts to manage scrap tires pursuant to the California Tire Recycling Act; thus, the regulation is not expected to increase tire waste streams or induce construction of new, or expansion of existing, waste tire disposal or recycling infrastructure. The program would not change driving habits or patterns, and thus would not induce or incentivize infrastructure projects. No construction, buildings or infrastructure will be developed under the regulation, and no related land disturbance would occur; no structures would be located on or near a resource recovery site. Therefore, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in the loss of availability of a locally important mineral resource recovery site delineated on a local general plan, specific plan, or other land use plan.

A.13 Noise

Traffic noise impacts the environment through a combination of sources. The sources of environmental noise caused by the use of vehicles include: mechanical noise, exhaust noise (tailpipe and stack exhaust on heavy trucks), tire/pavement noise, and aerodynamic noise (at high speeds). The type and texture of pavement have an effect on noise levels from the interaction of tires on pavement. In general, as pavements age and wear, the acoustic characteristics change and tire/pavement noise becomes louder (Caltrans 2013). At highway speeds, tire/pavement noise affects total vehicle noise to a greater extent than all the other vehicle noise sources combined. Tire/pavement noise on a passenger car operating at a steady freeway speed may account for as much as 75 to 90 percent of the vehicle noise energy, but these percentages may not be the same on louder, more acoustically complex heavy trucks. Efforts by Caltrans to reduce tire/pavement noise tend to focus on surface materials and pavement types, while considering a range of test tires. Variations in pavement types, materials, and textures can lead to 'quieter' pavement. However, because pavement becomes louder as traffic load wears it out over time, efforts to abate the environmental impacts of traffic noise normally focus on providing barriers and sound walls, which are effective in providing long term and durable noise reductions for impacted communities (Caltrans 2020).

The external rolling noise of in-use tires varies with vehicle travel speed, vehicle weight, and roadway surface, including wet or dry conditions and ambient temperatures. Individual tires will vary with the relative differences between tire tread design,

materials, size, and age. While the repeatability and reproducibility of noise measurements can vary within limits of 0.6 to 1.4 decibels (dB) within tests, average sound intensity levels can be expected to increase somewhat with increasing tire loading and increasing hardness (TRB 2011). In the United States, the federal Uniform Tire Quality Grading System (UTQG) does not include ratings for tire noise (Blackburn et al. 2026, Chapter 2).

NOISE	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
a. Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☒
b. Would the project result in generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☒
c. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, noise.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project result in generation of a substantial temporary or permanent increase in ambient noise levels in the vicinity of the project in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?

No Impact. The proposed RTEP regulations would not include any provisions that would change existing sources of ambient noise or existing levels of roadway noise.

Implementation and compliance actions associated with the RTEP would not be expected to change the ambient noise levels that occur during the manufacture or consumer use of replacement tires in compliance with new performance efficiency standards. Adjusting tread design may impact noise generation, and increasing tire compound stiffness (reducing hysteresis) may decrease the damping of road noise. However, achieving the required efficiency improvements is not expected to generate more road noise (Sellers et al. 2024).

Therefore, there would be no impact from the RTEP related to the generation of ambient noise levels or the likelihood of ambient noise levels occurring in excess of standards established in a local general plan or noise ordinance, or applicable standards of other agencies.

b. Would the project result in generation of excessive groundborne vibration or groundborne noise levels?

No Impact. The proposed RTEP regulations would not include any provisions that would change existing sources of vibration or existing levels of groundborne vibration or groundborne noise near roadways. Implementation and compliance actions associated with the RTEP would not be expected to change the levels of vibration that occur during the manufacture or consumer use of replacement tires in compliance with new performance efficiency standards.

Therefore, there would be no impact from the RTEP related to the generation of excessive groundborne vibration or groundborne noise levels.

c. For a project located within the vicinity of a private airstrip or an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?

No Impact. The proposed RTEP regulations would not include any provisions that would cause proposed projects to be sited near airports or within airport land use plans.

Implementation and compliance actions associated with the RTEP would not directly or indirectly cause projects to expose people to excessive noise levels within airport land use plans or within two miles of a public airport or public use airport.

Therefore, there would be no impact from the RTEP related to excessive noise levels near airports.

A.14 Population and Housing

The population and housing analysis typically examines the potential effects of a project's contribution to population and housing changes within the project's area of effect. The project's effects (e.g., expected in-migration from creation of new jobs) are compared to the adopted plans, growth forecasts, and other policies and programs that plan for future development to determine whether the project would be consistent with planned/ expected growth, and if there may be impacts to the environment from any unplanned growth.

This section describes the project's potential impacts on population and housing associated with adoption of the RTEP. This program is focused on improving the energy

efficiency of replacement tires through minimum performance standards for replacement tires for passenger cars and light-duty trucks in California.

The proposed project does not include any new building or infrastructure projects in California and there would be no anticipated change in the workforce. The RTEP regulations are focused on regulation of a specific commercial product, and those regulations do not attempt to control or influence population demographics or housing units in California. The RTEP would not have an indirect effect on population and housing because there are no foreseeable impacts of the RTEP that would affect current population or housing patterns in the state, especially considering there are no tire manufacturing facilities in California. For these reasons, the RTEP would not contribute to cumulative effects related to population and housing.

POPLUATION AND HOUSING Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☒
b. Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, population and housing.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Induce substantial unplanned population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?

No Impact. The RTEP is a proposed regulatory program for replacement tires. This program would not change driving habits or patterns, and thus, would not induce or incentivize infrastructure projects or actions that would induce population growth. Further, no tire manufacturing currently exists in California, and thus any potential effects to population from workforce would be outside of this CEQA analysis. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in population growth. No impact would occur.

b. Displace substantial numbers of existing people or housing, necessitating the construction of replacement housing elsewhere?

No Impact. The RTEP is a proposed regulatory program; therefore, it does not have a physical site location. There would be no change in population numbers or housing units. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would displace people or housing.

A.15 Public Services

"Public services" refers to various services provided by government agencies, primarily state and local agencies, including counties, cities, and special-purpose districts. While governments provide a wide range of services to the public, the environmental checklist in Appendix G of the State CEQA Guidelines focuses on government facilities for the provision of certain services, specifically fire protection, police protection, schools, and parks. It also includes the general category of "other public facilities" to capture any other types of public service facilities that could be affected by a project.

Public fire protection services in California are provided by a variety of agencies, including county and city fire departments, local fire districts, and state agencies such as CALFIRE. Many of these fire protection agencies also have the capabilities to provide emergency rescue services and emergency medical response. Federal agencies also provide fire-fighting capabilities that are sometimes used to assist state and local fire agencies, primarily the USDA Forest Service and U.S. Bureau of Land Management, which have capabilities largely oriented toward fighting wildland fires. Facilities primarily include fire stations where personnel and equipment are stationed, but can also include other facilities, such as training facilities.

Public police protection services are provided by multiple agencies, including county sheriff's departments and city police departments, as well as state agencies such as the California Highway Patrol. Law enforcement services are also provided by other state and federal agencies, such as game wardens of the California Department of Fish and Wildlife and the law enforcement officers of the USDA Forest Service and U.S. Bureau of Land Management. Facilities include stations, jails, and training facilities.

Public schools include any public educational facilities from primary school through college operated by local districts, municipalities, counties, and the State of California. These facilities include the school or college campuses as well as other public educational facilities, such as continuing education centers, school recreational facilities, and maintenance facilities.

Public parks include all publicly owned facilities designated for either active or passive recreational use. A wide variety of public recreational facilities exist, including local and regional parks, playfields, playgrounds, recreation centers, pools, beaches, lakes, and trails. Parks and recreational facilities may be owned by local government, including cities, counties, and districts, as well as the state and federal government. The primary

state agency that owns and operates parks and recreational facilities is the California State Department of Parks and Recreation, which operates 280 park units, including state parks, beaches, lakes, recreation areas, museums, historic sites, and visitor centers.

Other types of public facilities are also considered in CEQA environmental analysis, including libraries, museums, community centers, courthouses, transit facilities, public health facilities, public works facilities, and government administrative offices.

The proposed RTEP does not involve the provision of public services nor construction or maintenance of the facilities needed to provide public services. The RTEP regulations are focused on the regulation of replacement tires for passenger vehicles and light-duty trucks, and those regulations are not intended to affect the provision of public services in any substantive way. The RTEP is not expected to have any direct or indirect effect on public services because there are no foreseeable consequences of the RTEP that would either lead to an increase in the demand for public services or inhibit the delivery of public services. For these same reasons, the RTEP would not contribute to cumulative effects related to public services.

PUBLIC SERVICES	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:				
i. Fire protection?	☐	☐	☐	☒
ii. Police Protection?	☐	☐	☐	☒
iii. Schools?	☐	☐	☐	☒
iv. Parks?	☐	☐	☐	☒
v. Other public facilities?	☐	☐	☐	☒

Environmental checklist established by CEQA Guidelines, Appendix G, public services.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the

construction of which could cause significant environmental impacts, in order to maintain acceptable service ratios, response times, or other performance objectives for any of the public services:

i. Fire protection?

No Impact. As a regulatory program addressing replacement tires for passenger cars and light-duty trucks, the proposed RTEP would have no direct effect on fire protection services. The RTEP proposes to exempt replacement tires for emergency vehicles from the rolling resistance MPS. Therefore, the RTEP would not affect the operation and maintenance of fire and emergency vehicles that fall within the definition of an "authorized emergency vehicle" under California Vehicle Code section 165. If any fire vehicle fleet operators choose to equip vehicles with replacement tires that meet the rolling resistance MPS, it would increase the overall fuel efficiency of the fire vehicle fleet, resulting in a beneficial impact.

There are no foreseeable direct or indirect effects on fire protection as the RTEP would not increase fire risk, increase the potential severity of fires, alter fire-fighting capabilities, or inhibit emergency access. As a result, there is no foreseeable reason that implementation of the RTEP would increase demand for fire protection and related emergency services. Therefore, there would be no need for new, expanded, or altered fire protection facilities.

Although the RTEP would have no effect on fire protection services, the CEC staff acknowledges that tires constitute an existing potential fire hazard. Although tires do not ignite readily, if subjected to fire conditions they can burn rapidly, emitting intense heat and large quantities of toxic smoke, becoming difficult to extinguish. Therefore, a concentration of tires in any one area is a potential hazard. If a tire fire occurs, tires break down into hazardous compounds including gases, heavy metals, and oil. Air pollution is also produced by tire fires. Air pollutant emissions may include polycyclic aromatic hydrocarbons (PAHs), benzene, styrene, phenols, and butadiene (USEPA 2024f).

As discussed in Section A.19 (Wildfire), the proposed RTEP would not increase the risk of tire fires nor make them more hazardous as it would not impair emergency response or evacuation plans, exacerbate fire risks, contribute to the uncontrolled spread of fires, nor expose people or structures to fire-related risks. Furthermore, CEC staff does not anticipate that manufacturers will change tire composition in a way that would cause increased fire hazards.

ii. Police Protection?

No Impact. Similar to fire protection discussed above, the proposed RTEP would have no direct effect on police protection services. The RTEP proposes to exempt replacement tires for emergency vehicles from the rolling resistance

MPS, including police vehicles. Therefore, the RTEP would not affect the operation and maintenance of police vehicles that fall within the definition of an "authorized emergency vehicle" under California Vehicle Code section 165. If police vehicle fleet operators choose to equip vehicles with replacement tires that meet the rolling resistance MPS, it would increase the fuel efficiency of the overall police vehicle fleet, resulting in a beneficial impact.

There are no foreseeable direct or indirect effects on police protection as the RTEP would not increase crime, alter crime patterns, inhibit police patrols or investigations, or restrict emergency vehicle access. As a result, there is no foreseeable reason that implementation of the RTEP would increase demand for police protection. Therefore, there would be no need for new, expanded, or altered police facilities.

iii. Schools?

No Impact. As a regulatory program addressing replacement tires for passenger cars and light-duty trucks, the proposed RTEP would have no special effect on schools distinct from regulated entities, although some vehicles operated by schools could be subject to RTEP's requirement for replacement tires to meet the proposed standards for low rolling resistance. This would increase the overall fuel efficiency of the school vehicle fleet, resulting in a beneficial impact.

There are no foreseeable direct or indirect effects on schools as the RTEP would not increase school enrollment or alter school operations. As a result, there is no foreseeable reason that implementation of the RTEP would increase demand for school services. Therefore, there would be no need for new, expanded, or altered school facilities.

iv. Parks?

No Impact. The proposed RTEP would have no direct effect on parks or recreation facilities that would be distinct from regulated entities. There are no foreseeable effects on parks as the RTEP would increase demand for parks or recreation facilities or necessitate any changes related to park operation or maintenance. Therefore, there would be no need for new, expanded, or altered park facilities.

v. Other public facilities?

No Impact. Similar to the other public services discussed above, the proposed RTEP would have no direct or indirect effect on any other type of public service that would be distinct from regulated entities. There are no foreseeable effects of the RTEP that would increase demand for any type of public service or necessitate any changes to the delivery of any public service. Therefore, there would be no need for new, expanded, or altered public facilities.

A.16 Recreation

The recreation analysis focuses on facilities used for recreational activities, including parks and other types of recreational facilities, such as playgrounds, playfields, recreation centers, pools, beaches, and trails. Because CEQA is focused on effects on the physical environment, the impact analysis for recreation evaluates whether a project would result in physical changes to recreation facilities, such as increased use resulting in accelerated deterioration of existing facilities or the need to build new recreational facilities. Increased deterioration of a recreational facility could result in the need for additional maintenance or repairs. Such maintenance and repair activities could have effects that need to be evaluated to determine whether they would result in adverse impacts on the environment. Similarly, if a project involves the construction or expansion of recreational facilities, or would result in the need to expand or construct such facilities, the effects of the construction, operation, and maintenance of the new or expanded recreational facilities need to be evaluated for their potential to cause adverse impacts on the environment.

The proposed RTEP does not involve the construction of new or expanded recreational facilities and is not expected to lead to the increased use of existing recreational facilities. The RTEP regulations are focused on the regulation of replacement tires for passenger vehicles and light-duty trucks and those regulations do not attempt to direct or influence the use of recreational facilities in California in any way. There are no foreseeable consequences of the RTEP that would directly or indirectly affect how existing recreational facilities are utilized, including any changes to the types of recreational activities or the level of use by the public. Recreational facilities would continue to be owned, managed, and operated by the same governmental agencies and private organizations currently responsible for those facilities. For these same reasons, the RTEP would have no potential to contribute to cumulative effects related to the use, construction, or expansion of any recreational facilities in California.

RECREATION	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☒
b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G, recreation.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?

No Impact. There is no foreseeable reason that the RTEP would lead to the increased use of any parks or recreational facilities. Because the RTEP is a proposed regulatory program focused on certain performance characteristics of replacement tires, it would have no effect on the use of parks and other recreational facilities. For the same reason, the RTEP is not expected to indirectly cause an increase in the use of parks and other recreational facilities. As a result, implementation of the RTEP would not directly or indirectly cause an increase in the use of parks and recreational facilities that could lead to physical deterioration.

b. Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?

No Impact. The proposed RTEP does not involve the construction of new or expanded recreational facilities and is not expected to lead to the increased use of existing recreational facilities. Because the RTEP is a proposed regulatory program focused on certain performance characteristics of replacement tires, it would not create a need for new or expanded parks or other recreational facilities. Therefore, no new parks or recreational facilities would need to be constructed that might have an adverse effect on the environment.

A.17 Transportation

The transportation analysis typically examines the potential effects of the project's contribution to transportation changes within the project's area of effect. The project's effects, such as an increase in vehicle miles traveled (VMT), are compared to the adopted plans and other policies and programs that plan for future transportation infrastructure growth to determine whether the project would be consistent with the state's transportation and applicable air quality plans, and if there may be impacts to the environmental associated with the proposed project.

This section describes the potential transportation impacts associated with adoption of the RTEP. This program is focused on improving the energy efficiency of replacement tires through minimum performance standards for the replacement tires of passenger cars and light-duty trucks in California. The proposed RTEP does not include any new transportation infrastructure projects in California and there would be no anticipated increase in VMT associated with the RTEP. The RTEP regulations are focused on regulation of a specific commercial product, and those regulations do not attempt to control or influence overall personal or commercial vehicle usage in California. The RTEP would not have an indirect effect on transportation because there are no

foreseeable impacts of the RTEP that would affect current transportation patterns in the state, especially considering there are no tire manufacturing facilities in California. For these reasons, the RTEP would not contribute to cumulative effects related to transportation.

California has a diverse and extensive transportation system that includes various modes of transport to accommodate its large population and vast geography. Major metropolitan areas frequently experience traffic congestion, prompting ongoing discussions about infrastructure improvements (Caltrans 2024). Transportation systems contribute to air pollution (ozone production) and greenhouse gas emissions, leading to initiatives focused on efficient, sustainable transportation options. The Interstate System is made up of major highways such as Interstate 5, Interstate 10, and Interstate 80 facilitate long-distance travel and commerce throughout the State of California (Walbert 1996). California's State Routes complement the Interstate System, connecting urban and rural areas. California has significant freight rail networks, vital for transporting goods, particularly in agricultural regions. Amtrak provides intercity passenger rail services, with routes like the Pacific Surfliner connecting major coastal cities. California is developing a high-speed rail system intended to alleviate congestion and provide faster travel options between major cities. Many cities promote cycling with dedicated bike lanes and paths, and there are initiatives to improve bike-sharing programs. Urban areas often feature pedestrian-friendly infrastructure, including sidewalks, crosswalks, and walking trails. Major ports like the Port of Los Angeles and Port of Long Beach are crucial for international trade and cargo shipping.

Transportation Planning in California

Transportation planning efforts in the State of California involve a multi-agency system of local, regional, and statewide plans, programs, and regulations put in place to ensure the most complex transportation system in the nation is as safe and efficient as possible. This includes efforts focusing on climate change, mobility, conservation, economic growth, equity, and much more.

California Transportation Plan

The California State Transportation Agency (CalSTA), a cabinet-level agency, directs its various departments and divisions focused solely on transportation and adjacent topics. Under the delegation of the CalSTA, the California Department of Transportation (Caltrans) has created the California Transportation Plan (CTP) 2050. The CTP 2050 has been prepared to comply with Title 23, Code of Federal Regulations section 450.214, which implements the provisions of Title 23, United State Code section 135 and Title 49, United States Code section 5304. Caltrans has prepared the CTP pursuant to California Government Code Title 7 Division 1 Chapter 2.3. The law requires the Governor to submit the plan to the California State Legislature and the Secretary of the U.S. Department of Transportation (CalSTA 2021).

The CTP, updated every 5 years, is California's long-range transportation plan, which offers an opportunity to identify new solutions to the state's most pressing transportation challenges. The plan provides a foundational policy framework that is designed to close the gap between what the state's Regional Transportation Plans propose and what is needed to meet California's CTP 2050 targets. The CTP strategies and policies demonstrate the level of action required to make important transportation decisions in California. The plan is intended to guide transportation decision makers at all levels of government, while emphasizing the importance of shared responsibility in meeting the state's transportation needs. It identifies a vision for the future transportation system, establishes new statewide priorities, and serves as a roadmap to guide Caltrans and partner agencies in implementing these recommendations.

Regional Transportation Plans

Metropolitan Planning Organizations (MPOs) are the policy boards of organizations created and designated to carry out the metropolitan transportation planning process. MPOs are required to represent localities with populations over 50,000, as determined by the U.S. Census. A Regional Transportation Planning Organization (RTPO) is an organization that recognizes local transportation needs, conducts planning, assists local governments, and supports the statewide transportation planning process in nonmetropolitan regions of a State. States designate RTPOs as a method for formalizing the engagement of areas with a population size less than 50,000 as they incorporate rural transportation needs in the statewide transportation planning process (FHWA 2017). Both MPOs and RTPOs are required to develop an Overall Work Program and Regional Transportation Plan (RTP). There are 26 rural RTPAs that are responsible for the development of the state's RTPs.

Every MPO and RTPO is required by federal regulation (49 U.S.C. 5304[f] and 23 CFR 450[b]) and California statute (Government Code section 65080) to conduct long-range planning to ensure that the region's transportation vision and goals are clearly identified and to ensure effective decision making in furtherance of the vision and goals. RTPs are prepared by regional agencies to identify a 20-year vision for transportation priorities and investments. RTPs are developed by MPOs and RTPOs every four or five years in cooperation with the FHWA, Federal Transit Administration, Caltrans, and other stakeholders, including system users. The purpose of the RTP is to establish regional goals, identify present and future needs, deficiencies, and constraints, analyze potential solutions, estimate available funding, and propose investments (CTC 2024). While the RTP guidelines include both State and federal requirements for the development of RTPs, MPOs and RTPOs have the flexibility in selecting transportation planning options that best fit their regional needs (CTC 2024).

Sustainable Communities Strategies

Under Senate Bill 375, MPOs are required to adopt sustainable community strategies (SCS) as part of their RTPs. These SCSs demonstrate how integrated land use and transportation strategies will support the attainment of emissions reduction targets

adopted by the California Air Resources Board (CARB). The CTP 2050 incorporates regional plan assumptions into the baseline plan scenario assumptions, including the SCSs from the 18 MPOs.

In the case that an RTP, including the SCS, does not achieve the regional GHG emission reduction target, the MPO has the choice to either revise the SCS or prepare an Alternative Planning Strategy (APS). An APS would be separate from the RTP. If a region must prepare an APS, that alternative scenario must describe how GHG emissions target would be achieved through alternative development patterns, infrastructure, or additional transportation measures and policies (CTC 2024).

Congestion Management Process

A congestion management process (CMP) is a systematic, regional approach for managing congestion that provides accurate, up-to-date information on transportation system performance and assesses alternative strategies for congestion management that meet state and local needs. The CMP is intended to move these congestion management strategies into the funding and implementation stages. A CMP is required in all MPOs with population exceeding 200,000, known as Transportation Management Areas (TMAs). Federal requirements also state that in all TMAs, the CMP shall be developed and implemented as an integrated part of the metropolitan transportation planning process (FHWA 2024).

Local Circulation Elements

While the state's CTP incorporates the regional RTPs into the state's overall transportation planning efforts, cities are required to include Circulation Elements in their local General Plans. Government Code section 65302 requires each plan to include specific elements, one of them being a Circulation Element. The circulation element is not simply a transportation plan, but rather a strategy addressing infrastructure needs for the circulation of people, goods, energy, water, sewage, storm drainage, and communications. By statute, the circulation element must correlate directly with the land use element but also has direct relationships with other elements. The provisions of a circulation element affect a community's physical, social, and economic environment, as well as its health. As with any rapidly changing environment, recent legislation has driven change in the way local governments approach transportation. Some solutions include the incorporation of The Complete Streets Act, The Global Warming Solutions Act (Assembly Bill 32), Senate Bill 32, SCS, and the shift in CEQA transportation metrics away from Level of Service (LOS) to Vehicle Miles Traveled (VMT) through SB 743.

Vehicle Miles Traveled (SB 743)

The criteria for determining the significance of transportation impacts must "promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." (Id., subd. (b)(1); see generally, adopted CEQA Guidelines, § 15064.3, subd. (b) [Criteria for Analyzing Transportation

Impacts].) To that end, in developing the criteria, the Office of Planning and Research (OPR) proposed changes to the State CEQA Guidelines identifying vehicles miles traveled (VMT) as the most appropriate metric to evaluate a project's transportation impacts. The California Natural Resources Agency subsequently certified and adopted changes to the CEQA Guidelines (OPR 2018).

Senate Bill 32 (*VMT and Greenhouse Gas Emissions Reduction*) requires California to reduce greenhouse gas (GHG) emissions to 40 percent below 1990 levels by 2030, and Executive Order B16-12 provides a target of 80 percent below 1990 emissions levels for the transportation sector by 2050. The transportation sector has three major means of reducing GHG emissions: increasing vehicle efficiency, reducing fuel carbon content, and reducing the amount of vehicle travel.

Further, in its 2018 Progress Report on California's *Sustainable Communities and Climate Protection Act*, CARB found that despite the State meeting its 2020 climate goals, "emissions from statewide passenger vehicle travel per capita [have been] increasing and going in the wrong direction," and "California cannot meet its [long-term] climate goals without curbing growth in single-occupancy vehicle activity." Thus, to achieve the State's long-term climate goals, California needs to reduce per capita VMT, and this can occur under CEQA through VMT mitigation. Because half of California's GHG emissions come from the transportation sector, reducing VMT is an effective climate strategy, which can also result in other benefits. Meeting greenhouse gas reduction targets will require substantial reductions in existing VMT per capita to curb GHG emissions and other pollutants.

TRANSPORTATION Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Conflict with a program, plan, ordinance or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?	☐	☐	☐	☒
b. Conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?	☐	☐	☐	☒
c. Substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☒
d. Result in inadequate emergency access?	☐	☐	☐	☒

Environmental checklist established by State CEQA Guidelines, Appendix G.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project conflict with a program, plan, ordinance, or policy addressing the circulation system, including transit, roadway, bicycle, and pedestrian facilities?

No Impact. The RTEP is a proposed regulatory program for replacement tires. This program is not expected to have any effect on existing driving habits or circulation patterns in California and, thus, would not conflict with any program, plan, ordinance, or policy addressing transportation. The implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in changes to the state's transportation network. Therefore, no impact would occur.

b. Would the project conflict or be inconsistent with CEQA Guidelines section 15064.3, subdivision (b)?

No Impact. The RTEP is a proposed regulatory program and therefore does not have a physical site location. Furthermore, no tire manufacturing currently exists in California, and thus any potential effects to an increase in population from workforce, and thus an increase in VMT from those individuals travelling to and from tire manufacturing facilities, would be outside the scope of this CEQA analysis.

As described above, the criteria for determining the significance of transportation impacts under CEQA must "promote the reduction of greenhouse gas emissions, the development of multimodal transportation networks, and a diversity of land uses." Therefore, the State CEQA Guidelines identify vehicles miles traveled (VMT) as the most appropriate metric to evaluate a project's transportation impacts.

In *Center for Biological Diversity v. California Dept. of Fish & Wildlife*, supra, 62 Cal.4th at p. 220, the Court noted that when a lead agency uses consistency with climate goals as a way to determine significance, particularly for long-term projects, the lead agency must consider the project's effect on meeting long-term reduction goals. And more recently, the Supreme Court stated that "CEQA requires public agencies… to ensure that such analysis stay in step with evolving scientific knowledge and state regulatory schemes."

The RTEP is a state regulatory program designed to assist in the state's efforts of achieving the goals articulated in its climate action plans. The RTEP program would provide a method for increasing the efficiency of replacement tires for passenger cars and light-duty trucks. The program would increase the efficiency of replacement tires, which would increase the fuel efficiency of vehicles and reduce the amount of GHG emitted by passenger cars and light-duty trucks in the state. These measures would be consistent with CARB's Scoping Plan to reduce GHG emissions and other harmful air pollutants, while also reducing fuel usage. The program would not increase VMT in the state. No impact would occur.

c. Would the project substantially increase hazards due to a geometric design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?

No Impact. The RTEP is a proposed regulatory program for replacement tires and does not involve any changes to roadways or other transportation systems. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in an increase in hazards due to a geometric design feature or incompatible uses of the state's transportation network. No impact would occur.

d. Would the project result in inadequate emergency access?

No Impact. The RTEP is a proposed regulatory program for replacement tires and does not include any transportation infrastructure work. As a result, the implementation of the RTEP would have no foreseeable physical consequences in the environment that would result in any inadequate emergency access at any location within the state's transportation network. Please note that the RTEP proposes to exempt authorized emergency vehicles from the rolling resistance MPS. Therefore, the RTEP would not affect the operation or maintenance of emergency vehicles. No impact would occur.

A.18 Utilities and Service Systems

In the context of the CEQA environmental checklist, the term "Utilities and Service Systems" refers to water, wastewater, storm water drainage, electrical power, natural gas, and telecommunications systems, as well as solid waste facilities. For water supply systems, this includes water supply, treatment, and delivery infrastructure as well as the sources and availability of water needed to serve project needs. For wastewater systems, also known as sanitary sewer systems, this includes wastewater collection infrastructure and wastewater treatment facilities, including the capacity of these systems to serve project needs. Storm water drainage systems include the infrastructure and facilities necessary for collecting surface water runoff generated by storms and delivering it to receiving waters, including facilities designed to provide flood protection. For electric, natural gas, and telecommunication systems, this includes the infrastructure and facilities needed to deliver services to customers. Solid waste systems include landfills, transfer facilities, and other facilities required for the collection and disposal of solid waste.

CEQA's focus is on whether changes to these systems are needed to serve a proposed project. For example, the expansion or alteration of a facility may be needed to serve the increased demand that a project places on a utility system. Such expansion or alteration of utility infrastructure typically involves new construction, which can have effects on the physical environment and potentially cause adverse environmental impacts. The consideration of effects on water resources also asks whether adequate long-term water supplies are available to serve the project, even during periods of drought. The consideration of solid waste impacts also asks whether implementation of

a project would impair the attainment of public solid waste reduction goals or conflict with solid waste management and reduction regulations.

Utilities and other service systems are primarily provided by public agencies and regulated private utilities. For example, water is often supplied by a local water district or municipal water utility but can also be provided by a private water company depending on service territory boundaries. Electricity and natural gas are often provided by privately owned utilities that are regulated by the state but can also be provided by municipal utilities or other local agencies. Wastewater systems and storm drainage systems are usually built and maintained by county and city agencies, although private drainage facilities may connect to these systems. Telecommunication services, such as telephone and internet services, are almost always provided by private companies. Landfills may be public or private and solid waste collection services are often provided by private companies under a contract granted by county or city government.

The proposed RTEP does not involve the provision of utility services, nor the construction or maintenance of the facilities needed to provide those services. The RTEP regulations are focused on the regulation of replacement tires for passenger vehicles and light-duty trucks, and those regulations are not intended to affect utilities or service systems in any substantive way. The RTEP is not expected to have any significant direct or indirect effects related to utilities because there are no foreseeable consequences of the RTEP that would either lead to an increase in the demand for utility services or require the construction or expansion of utility infrastructure. For these same reasons, the RTEP is not expected to contribute to cumulative effects related to utilities and service systems.

UTILITIES AND SERVICE SYSTEMS Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. Require or result in the relocation or construction of new or expanded water, wastewater treatment, storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?	☐	☐	☐	☒
b. Have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?	☐	☐	☐	☒
c. Result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition	☐	☐	☐	☒

UTILITIES AND SERVICE SYSTEMS Would the project:	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
to the provider's existing commitments?				
d. Generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?	☒	☐	☐	☐
e. Comply with federal, state, and local management and reduction statutes and regulations related to solid waste?	☒	☐	☐	☐

Environmental checklist established by State CEQA Guidelines, Appendix G, utilities and service systems.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. Would the project require or result in the relocation or construction of new or expanded water, wastewater treatment, storm water drainage, electric power, natural gas, or telecommunications facilities, the construction or relocation of which could cause significant environmental effects?

No Impact. Because the RTEP is a regulatory program focused on the efficiency of replacement tires for passenger cars and light-duty trucks, it would not require the construction or alteration of any water, wastewater, storm water drainage, electric power, natural gas, or telecommunications facilities. The RTEP would have no foreseeable direct or indirect effect on the provision of these utility services and, therefore, would not require the construction, expansion, or alteration of any utility facilities or infrastructure. As a result, no physical effects on the physical environment from the construction of utility infrastructure would occur.

Because there is no tire manufacturing in California, any changes in the tire manufacturing process that require changes in utility services in other states would have no effects that are subject to the requirements of CEQA. Changes in the rolling resistance of replacement of tires would also have no effect on the utility use of tire retailers or tire service centers in California as the RTEP would only result in technical changes to tires and not changes in the utility requirements of these establishments.

Some of the vehicles in the fleets of utility providers, including those of both public agencies and private companies, would be subject to RTEP's requirement for replacement tires to meet the proposed standards for low rolling resistance. This would increase the overall fuel efficiency of the utility vehicle fleet, resulting in a beneficial impact.

b. Would the project have sufficient water supplies available to serve the project and reasonably foreseeable future development during normal, dry and multiple dry years?

No Impact. The proposed RTEP regulations do not require the consumption of water and would have no effect on water supplies. The RTEP would regulate the rolling resistance of replacement tires, which does not have an effect on water consumption. Because there is no tire manufacturing in California, any change in the tire manufacturing process that might require the use of water would have no effects that are subject to the requirements of CEQA. Changes in the rolling resistance of replacement of tires would also have no effect on the water consumption of tire retailers or tire service centers in California as the RTEP would only result in technical changes to tires and not changes in the water consumption needs or habitats of these establishments.

c. Would the project result in a determination by the wastewater treatment provider which serves or may serve the project that it has inadequate capacity to serve the project's projected demand in addition to the provider's existing commitments?

No Impact. The proposed RTEP regulations do not involve the generation of wastewater and would have no effect on wastewater systems, including wastewater treatment facilities. The RTEP would regulate the rolling resistance of replacement tires, which does not have an effect on wastewater collection or treatment. Because there is no tire manufacturing in California, any change in the tire manufacturing process that might increase wastewater generation would have no effects that are subject to the requirements of CEQA. Changes in the rolling resistance of replacement of tires would also have no effect on the wastewater generation of tire retailers or tire service centers in California as the RTEP would only result in technical changes to tires and not changes in the wastewater generation characteristics of these establishments.

d. Would the project generate solid waste in excess of State or local standards, or in excess of the capacity of local infrastructure, or otherwise impair the attainment of solid waste reduction goals?

This topic has been carried forward for discussion in the EIR. See the discussion in EIR Section 3.1, *Utilities and Service Systems: Solid Waste*.

e. Would the project comply with federal, state, and local management and reduction statutes and regulations related to solid waste?

This topic has been carried forward for discussion in the EIR. See the discussion in EIR Section 3.1, *Utilities and Service Systems: Solid Waste*.

A.19 Wildfire

This section assesses the project's potential to affect several aspects of wildfire risk and emergency response, including any adverse effects on emergency response or evacuation plans, exacerbation of wildfire risks or environmental damage, and exposure of people or structures to increased hazards associated with wildfires.

The California Department of Forestry and Fire Protection (CAL FIRE) identifies and maps areas of significant fire hazards based on fuels, terrain, and other relevant factors. These maps categorize this information by Fire Hazard Severity Zones (FHSZ), grouped into unzoned, moderate, high, and very high zones. State Responsibility Areas (SRA) are locations where the state of California is responsible for wildfire protection and Local Responsibility Areas (LRA) are locations where the responding agency is the county or city.

Wildfire is a persistent and devastating problem in California. CAL FIRE and the USDA Forest Service responded to 6,324 wildfires in the state in 2023, which burned a total 308,897 acres of land, which was substantially less than California's five-year average (CAL FIRE 2024b). During the five-year period ending on November 12, 2024, the two agencies responded on an average of 7,149 fires per year, and those fires burned an annual average of 1,282,377 acres. 2020 was a particularly devastating year when more than 9,000 wildfires burned over 4.2 million acres in California, causing widespread destruction and significant loss of life and property.

The number of large fires (10,000 acres or more) has increased in the past two decades. All but two of the 20 largest wildfires between 1950 and 2023 occurred since the year 2000; ten of these burned in 2020 and 2021 (OEHHA 2024c). Climate change, drought conditions, and a buildup of dry vegetation have all contributed to an increase in wildfires. As a result, CAL FIRE and other organizations have implemented various measures to reduce the risk of wildfires, including increased fire prevention efforts, better firefighting technology and resources, and community preparedness initiatives.

WILDFIRE	**Potentially Significant Impact**	**Less Than Significant with Mitigation Incorporated**	**Less Than Significant Impact**	**No Impact**
a. If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:				
i. Substantially impair an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☒
ii. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentra-	☐	☐	☐	☒

WILDFIRE	Potentially Significant Impact	Less Than Significant with Mitigation Incorporated	Less Than Significant Impact	No Impact
tions from a wildfire or the uncontrolled spread of a wildfire?				
iii. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?	☐	☐	☐	☒
iv. Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?	☐	☐	☐	☒

Environmental checklist established by CEQA Guidelines, Appendix G, wildfire.

Explanations for the impact significance conclusions presented in the table above are provided below.

a. If located in or near state responsibility areas or lands classified as very high fire hazard severity zones, would the project:

i. Substantially impair an adopted emergency response plan or emergency evacuation plan?

No Impact. As a regulatory program focused on the rolling efficiency of replacement tires, the RTEP does not have the potential to impair emergency response plans for wildfires or emergency evacuation plans. Emergency response plans and emergency evacuation plans would be able to be implemented as intended regardless of the rolling resistance standards for replacement tires required by the RTEP. There is no foreseeable adverse consequence to the functioning of emergency response and evacuation plans that would be caused by the RTEP.

The RTEP proposes to exempt emergency vehicles from the rolling resistance minimum performance standard. Replacement tires for emergency response vehicles would continue to function similarly to existing tires on the market. The proposed RTEP includes requirement for replacement tires to provide a relative wet grip braking performance index performance standard, which would indicate a tire's ability to stop on wet pavement for vehicles equipped with modern braking and handling systems. Therefore, the safety and performance of replacement tires would not be compromised compared to

existing replacement tires available for emergency response vehicles or vehicles used for emergency evacuations.

ii. Due to slope, prevailing winds, and other factors, exacerbate wildfire risks, and thereby expose project occupants to, pollutant concentrations from a wildfire or the uncontrolled spread of a wildfire?

No Impact. As a regulatory program focused on the rolling efficiency of replacement tires, the RTEP does not have the potential to alter factors that affect wildfire risks or contribute to the spread of wildfire. There is no foreseeable reason that the RTEP would directly or indirectly affect wildfire risk.

As discussed in Section A.15, the CEC staff acknowledges that tires constitute a potential existing fire hazard. Although tires do not ignite readily, if subjected to fire conditions they can burn rapidly, emitting intense heat and large quantities of toxic smoke, becoming difficult to extinguish. Therefore, a concentration of tires in any one area is a potential hazard. If a tire fire occurs, tires break down into hazardous compounds including gases, heavy metals, and oil. Air pollution is also produced by tire fires. Air pollutant emissions may include polycyclic aromatic hydrocarbons (PAHs), benzene, styrene, phenols, and butadiene (USEPA 2024f). The proposed RTEP would not increase the risk of fires involving tires nor make them more hazardous.

iii. Require the installation or maintenance of associated infrastructure (such as roads, fuel breaks, emergency water sources, power lines or other utilities) that may exacerbate fire risk or that may result in temporary or ongoing impacts to the environment?

No Impact. As discussed above, the RTEP would not affect wildfire risks or contribute to the spread of wildfires. Therefore, the RTEP would create no need to install or maintain any infrastructure that might exacerbate fire risk or result in impacts to the environment. As a result, no impact would occur due to adoption of the RTEP.

iv. Expose people or structures to significant risks, including downslope or downstream flooding or landslides, as a result of runoff, post-fire slope instability, or drainage changes?

No Impact. As discussed above, the RTEP would not affect wildfire risks or contribute to the spread of wildfires. Therefore, the RTEP would not expose people or structures to any fire or post-fire hazards, including flooding, landslides, slope stability, and drainage changes. As a result, no impact would occur due to adoption of the RTEP.

References

Blackburn et al. 2026 – Blackburn, Bill, Julie Burbridge, Andrew Hom, Ralph Lee, Ken Rider, David Sakai, Sebastian Serrato, and Rachel Shuen. 2026. *California's Proposed Replacement Tire Efficiency Program*. California Energy Commission. Publication Number: CEC-600-2026-012.

CAL FIRE 2024b – CAL FIRE (California Department of Forestry and Fire Protection). 2024b. "Statistics." Available at https://www.fire.ca.gov/our-impact/statistics. Accessed November 12, 2024.

CARB 2015 – CARB (California Air Resources Board). 2015. "Black Carbon Inventory." Available at https://ww2.arb.ca.gov/sites/default/files/classic/cc/inventory/slcp/data/slcp_bc_20yr1.pdf.

_____ 2017. "Short-Lived Climate Pollutant Reduction Strategy." Available at https://ww2.arb.ca.gov/sites/default/files/2020-07/final_SLCP_strategy.pdf.

_____ 2022. *Scoping Plan for Achieving Carbon Neutrality*. December. Available at https://ww2.arb.ca.gov/sites/default/files/2023-04/2022-sp.pdf.

_____ 2024a. "Characterization of Tire-Wear and Brake-Wear PM Emissions Under On-Road Driving Conditions." Available at https://ww2.arb.ca.gov/characterization-tire-wear-and-brake-wear-pm-emissions-under-road-driving-conditions.

CalSTA 2021 – CalSTA (California State Transportation Agency). 2021. "California Transportation Plan 2050." Available at https://dot.ca.gov/-/media/dot-media/programs/transportation-planning/documents/ctp-2050-v3-a11y.pdf.

Caltrans 2013 – Caltrans (California Department of Transportation). 2013. *Technical Noise Supplement to the Traffic Noise Analysis Protocol*. September. Available at https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/tens-sep2013-a11y.pdf.

_____ 2020. *Traffic Noise Analysis Protocol*. April. Available at https://dot.ca.gov/-/media/dot-media/programs/environmental-analysis/documents/env/traffic-noise-protocol-april-2020-a11y.pdf.

_____ 2024. "California Department of Transportation." Available at www.dot.ca.gov.

CTC 2024 – CTC (California Transportation Commission). 2024. *2024 Regional Transportation Plan Guidelines for Metropolitan Planning Organizations*. Available at https://catc.ca.gov/-/media/ctc-media/documents/programs/transportation-planning/adopted-2024-rtp-guidelines-for-mpos.pdf.

FHWA 2017 – FHWA (Federal Highway Administration). 2017. "What Is a Regional Transportation Planning Organization?" RTPO 101 Fact Sheet Series. Available at

https://www.planning.dot.gov/documents/RTPO_factsheet_What_is_an_RTPO.pdf.

_____ 2024. "Congestion Management Process (CMP)." Available at https://ops.fhwa.dot.gov/plan4ops/focus_areas/cmp.htm.

OEHHA 2024d – OEHHA (Office of Environmental Health Hazard Assessment). 2024d. "Wildfires." Available at https://oehha.ca.gov/climate-change/epic-2022/impacts-vegetation-and-wildlife/wildfires. Accessed November 12, 2024.

OPR 2018 – OPR (California Governor's Office of Planning and Research). 2018. *Technical Advisory on Evaluating Transportation Impacts in CEQA*. Available at https://lci.ca.gov/docs/20180416-743_Technical_Advisory_4.16.18.pdf.

Sellers et al. 2024 – Sellers, Bradley, Bruce Lambillotte, and Joshua Guilliams. 2024. "23-1009841BS Rolling Resistance and Tire Technology." Smithers. Prepared for Aspen Environmental Group to support the Environmental Impact Report for the California Replacement Tire Efficiency Program. December.

TRB 2011 – TRB (Transportation Research Board of The National Academies). 2011. *Project 1-44 (1) Measuring Tire-Pavement Noise at the Source: Precision and Bias Statement*. Prepared for: National Cooperative Highway Research Program. July 14. Available at https://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp01-44(01)_FR.pdf.

USEPA 2024f – USEPA (U.S. Environmental Protection Agency). 2024f. "Tire Fires." Available at https://archive.epa.gov/epawaste/conserve/materials/tires/web/html/fires.html. Accessed June 12, 2024.

Walbert 1996 – Walbert, David F. 1996. "Federal-Aid Highway Act of 1956: Creating the Interstate System." *Public Roads*, 60(1). Summer 1996. U.S. Department of Transportation Federal Highway Administration. Available at https://www.semanticscholar.org/paper/FEDERAL-AID-HIGHWAY-ACT-OF-1956%3A-CREATING-THE-Walbert/34215029bdfd45d0941efa0938f4ed1c5c08b1a3.

Appendix B

Notice of Preparation

Notice of Preparation of a Draft Environmental Impact Report

In accordance with California Code of Regulations, title 14, section 15082, California Energy Commission (CEC) staff has prepared this Notice of Preparation (NOP) to inform the Office of Planning and Research (OPR) and each responsible and trustee agency that an Environmental Impact Report (EIR) will be prepared for the Replacement Tire Efficiency Program (RTEP) proposed for the state of California. The proposed RTEP constitutes the "project" under the California Environmental Quality Act (CEQA).

The project consists of a program and regulations designed to ensure that replacement tires sold in California are, to the extent feasible, at least as energy efficient as the tires sold as original equipment on passenger cars and light-duty trucks. The RTEP regulations would be applicable to the entire state of California.

The CEC is requesting your agency's comments on the scope of the EIR to be prepared. The purpose of this Notice of Preparation is to solicit the views of the public, government agencies, and organizations as to the scope and content of the environmental information and analysis, including the significant environmental issues and reasonable alternatives and mitigation measures specifically associated with the proposed project that should be included in the EIR.

Assembly Bill 844

Under the authority granted by Assembly Bill (AB) 844 (Nation, Ch. 645, Statutes of 2003), the CEC is mandated to adopt and implement a statewide RTEP for passenger cars and light-duty trucks that ensures that replacement tires, to the extent feasible, are at least as energy efficient as the tires sold as original equipment tires found on new vehicles.

An Order Instituting Information proceeding was approved at CEC's November 2020 Business Meeting. The proceeding has resulted in the preparation of a February 2023, staff report, titled "Draft Framework of California's Replacement Tire Efficiency Program" (publication # CEC-600-2023-026-SD, found at the link below) which provided an overview of the proposed program. Since the 2023 staff report, the CEC has made substantial changes to the proposed program and anticipates releasing a revised RTEP framework report in late 2024.

The RTEP will establish minimum efficiency standards for replacement tires, as well as an associated consumer information campaign.

CEC staff has determined that the proposed RTEP qualifies as a project subject to CEQA review and that there is the potential for the RTEP to result in significant environmental impacts, thereby requiring preparation of an EIR.

Response to Notice of Preparation

Pursuant to the NOP rule in the State CEQA Guidelines (Cal. Code of Regs, tit. 14, § 15082(b)), each responsible and trustee agency and the OPR shall provide CEC with specific detail about the scope and content of the environmental information related to the responsible or trustee agency's area of statutory responsibility that must be included in the draft EIR. At a minimum, the response shall identify:

- The significant environmental issues and reasonable alternatives and mitigation measures that the responsible or trustee agency, or the OPR will need to have explored in the draft EIR; and
- Whether the agency will be a responsible agency or trustee agency for the project.

This response is due to CEC within 30 days of receipt of the NOP. Staff requests your comments by **October 18, 2024**. If a responsible or trustee agency, or the OPR fails by the end of the 30-day period to provide CEC with either a response to the notice or a well-justified request for additional time, CEC staff will presume that none of those entities have a response to make.

You may submit comments electronically. To use CEC's electronic commenting feature, go to CEC's proceeding webpage for this proceeding, click on the "Submit Comment" link, and follow the instructions in the online form.

https://efiling.energy.ca.gov/EComment/EComment.aspx?docketnumber=20-TIRE-01

You can connect to the comment submission page using the QR code below.

Be sure to include the project name in your comments. Once filed, you will receive an email with a link to them and the comments will be part of the proceeding's public record.

Project Webpage, Subscription, and Contact Information

The CEC maintains a webpage for this project at: https://www.energy.ca.gov/programs-and-topics/programs/replacement-tire-efficiency-program.

The CEC maintains a webpage for this proceeding: https://efiling.energy.ca.gov/Lists/DocketLog.aspx?docketnumber=20-TIRE-01

To receive electronic notices of all project-related activities and documents, go to CEC's subscription page https://www.energy.ca.gov/subscriptions under "Transportation Energy" and check the "RTEP" box under "Projects Under Review".

If you have any questions or need additional information on how to participate in CEC's review of the proposed project, please contact the Fuels and Transportation Division by email at FTD@energy.ca.gov.

Project Description and Background

Federal fuel economy regulations provide a strong incentive for automobile manufacturers to ensure that original equipment (OE) tires are designed and manufactured to be energy efficient. However, no regulations or similar incentives exist for replacement tires, which has resulted in replacement tires, in general, not being as energy efficient as OE tires. According to CEC staff analysis, replacement tires tend to vary greatly in efficiency, and on average, OE tires are approximately 15 to 20 percent more energy efficient than replacement tires.

The Replacement Tire Efficiency Program would include the following key features applicable to replacement tires sold or offered for sale in the state:

- A tire efficiency consumer information program.
- Reporting requirements for tire manufacturers.
- A CEC tire rolling resistance efficiency database.
- Tire minimum performance standards.

The project to be evaluated in the EIR is the proposed Replacement Tire Efficiency Program (RTEP or Project). The proposed RTEP seeks to improve the energy efficiency of replacement tires through the establishment of minimum performance standards for replacement tires for passenger cars and light-duty trucks sold in California. The RTEP also proposes to improve consumer access to

information on the energy efficiency of replacement tires. The RTEP regulations have no specific physical location but would be applicable to the entire state of California.

Consumer Information Program

The proposed regulations would include a consumer information program that would provide replacement tire information at the point of sale but not labels or markings on tires. Tire retailers would be required to display conspicuous and accessible information through signage about the energy efficiency tire rating system. Although tire retailers will not need to provide efficiency ratings of all tires, the required signage shall include a web address and quick response code (QR code) linking to the CEC's website, which in turn will provide specific tire efficiency ratings and related information. Physical tire retailers (as opposed to online merchants) would additionally be required to provide, upon request, a disclosure of the specific ratings for tires being considered. Tire retail salespeople will be trained to explain the rating system to consumers and answer potential questions on tire energy efficiency.

The RTEP proposes a tire rating system for the fuel efficiency of replacement tire models. A simple graphic rating system would communicate the efficiency of an individual tire to consumers, helping them quickly and easily determine how various tire models are expected to affect the fuel economy of their vehicle.

The RTEP also proposes that the Consumer Information Program disseminate information on the benefits of tire maintenance on tire treadwear, traction, and fuel economy. The program would provide information and suggestions on how to best maintain tires, including information on proper tire inflation, rotation, balancing, alignment, and inspection. This information will be available on the CEC's website and possible other venues, such as conferences, webinars, etc.

Tire Manufacturer Reporting Requirements

The proposed RTEP regulations require tire manufacturers and/or brand name owners selling tires in California to regularly report information about their products to the CEC. The information collected would allow CEC staff to identify reported tires and assist staff in monitoring the tire market to ensure that the regulations are complied with and do not adversely affect program feasibility, cost-effectiveness, safety, tread life, or management of the state's scrap tire program.

The RTEP would allow manufacturers to self-certify the rolling resistance (a measure of a tires energy efficiency), treadwear, and traction ratings for its tires instead of submitting actual test measurements. Manufacturers would be required

to exercise due care in certifying their tires and provide test documentation to the CEC upon request.

Tire Rolling Resistance Efficiency Database

AB 844 requires the CEC to develop a database of the energy efficiency of replacement tires sold in the state. The proposed RTEP includes an online database containing, at a minimum, the data submitted from tire manufacturers through the reporting requirements in these regulations. This database is proposed to be called the Tire Rolling Resistance Efficiency Database, or "TRRED" for short. The TRRED would allow manufacturers to report and certify data via an online data submission system.

Minimum Rolling Resistance Performance Standard

A rolling resistance coefficient (RRC) minimum performance standard based on the ISO 28580:2018 test protocol would be established for all qualifying replacement tires sold in California. These regulations will be implemented in two phases. Phase I will begin January 1, 2028, followed by Phase II, with a more stringent performance standard, beginning January 1, 2031. The minimum performance standard sets the maximum RRC a tire in each regulated class can have and still be legally sold in California. The efficiency minimum performance standard will be based on several product categories (i.e., ultra-high performance tires, LT, etc.), which will have adjustments to a base tire RRC, making the standards less stringent for certain tire categories in order to provide the industry with greater flexibility in meeting consumer needs while meeting the standards. In cases where a tire model qualifies in more than a single tire category, the highest RRC — that is, most lenient — minimum performance standard will apply.

Unless specifically excluded, all replacement tires sold in California will have to comply with the efficiency minimum performance standard, including original equipment tires that are sold as replacement tires.

Tire Wet Grip Minimum Performance Standard

AB 844 stipulates that the RTEP must not compromise tire safety. Traction is a characteristic of tires that the proposed regulations use as a measure of tire safety. The federal government requires manufacturers to imprint a Uniform Tire Quality Grading (UTQG) system traction rating on the side of tires that indicates a tire's ability to stop on wet pavement.

The CEC's proposed regulation proposes a minimum wet traction requirement of 1.0 will be required based on the ISO 23671:2021 test protocol. Tires that do not meet the specified wet traction requirement will not be legal for sale in California. This wet grip minimum performance standard is essentially a minimum

requirement for tire safety and was suggested by tire industry representatives. The minimum wet traction performance requirement is expected to mitigate the potential of a tire manufacturer making a tire that has poor wet grip that otherwise meets California's RRC minimum performance standards.

RTEP Applicability

AB 844 defines "replacement tire" as a tire sold in the state that is designed to replace a tire sold with a new passenger car or light-duty truck. The proposed RTEP regulations would apply, with few exceptions, to all tire retailers, manufacturers, and tire brand name owners of any new tire that is sold or offered for sale in California.

Per AB 844, replacement tires do not include used tires, retreaded tires, or any of the following tires:

- a limited production tire;
- a deep tread tire;
- a winter-type snow tire;
- a space-saver tire;
- a temporary use spare tire;
- a tire with a nominal rim diameter of 12 inches or less;
- a motorcycle tire; or
- a tire manufactured specifically for use on an off-road motorized recreational vehicle.

The regulations do not prohibit a tire retailer from selling or offering for sale replacement tires that do not meet the standards in subsections (a) through (e) directly to an owner or operator of one or more authorized emergency vehicles as defined by section 165 of the Vehicle Code to equip its authorized emergency vehicles.

The regulations will apply to all manufacturers and brand name owners, and tire retailers of replacement tires sold in California. Regulation components will carry through in multiple phases to account for creation of the tire efficiency database and submission of tire data, prior to the implementation of the minimum performance standards for efficiency and wet grip.

The CEC tire rolling resistance efficiency database will allow manufacturers to submit tire reporting requirements, provide the energy efficiency rating for each replacement tire, provide a compliant tire energy efficiency sign for use in retail locations, and provide vehicle fuel efficiency information to consumers.

CEC staff analyzed the cost-effectiveness and technical feasibility of the minimum performance standard for replacement tires for passenger vehicles. Statewide fuel and energy use, annual reductions in greenhouse gases, and consumer savings were considered in the development of the RTEP. The RTEP would be reviewed and revised, as needed, at least every three years following adoption and implementation.

Benefits

Replacement tires for passenger vehicles and light trucks with low rolling resistance improve vehicle fuel economy leading to the following expected benefits:

- Reduction of greenhouse gas emissions by well over 1 million metric tons of CO2 equivalent annually when the program is fully operational,
- Provision of an affordable way for individual Californians to reduce greenhouse gas emissions,
- Enhanced efficiency of passenger vehicles and light trucks in line with the original tires sold with the vehicle (original equipment),
- Reduction of fuel costs to consumers driving combustion vehicles and zero-emission vehicles, and
- Reduction of tailpipe and upstream emissions associated with the production of transportation fuels, which contribute to ozone formation and unhealthy air quality.

Probable Environmental Effects

The EIR will analyze the reasonably foreseeable direct, indirect, and cumulative effects of the proposed RTEP in the topical categories presented in the environmental checklist in Appendix G of the State CEQA Guidelines, plus environmental justice (EJ).

Based on its analysis to date, the CEC staff has identified that the project would likely have no or less-than-significant impacts in all the topical categories in Appendix G with the possible exceptions of Utilities and Service Systems (specifically solid waste) and Hydrology and Water Quality (specifically aquatic water quality). The analysis of solid waste would examine the unlikely, but possible, increase in wear rates of more energy efficient replacement tires, which could lead to increased tire waste. An analysis of water quality would likely focus on rubber particles from tires as a water pollutant if tire wear rates increase.

The CEC staff is still gathering information associated with the environmental topics in Appendix G. Staff's analysis will include any information provided by

other agencies in response to this notice that can inform the CEC's environmental review. Mitigation measures or alternatives will be proposed to reduce or avoid significant impacts identified in the EIR, as feasible.

Alternatives

The EIR will consider a reasonable range of potentially feasible alternatives to the project. In addition to a no project alternative, the EIR will likely consider alternatives that would involve changes to the RTEP's proposed efficiency standards, tire rating system, manufacturer reporting requirements, and/or consumer information program. Suggestions are welcome for other feasible alternatives that would meet most project objectives and reduce significant impacts.

Environmental Justice and Disadvantaged Communities

California has disadvantaged communities distributed in various areas across the state. The CEC staff will analyze whether the RTEP would result in any potentially significant disproportionate impacts to any disadvantaged communities in the state.

Responsible Agencies

No other agencies will need to issue approvals or permits for the RTEP other than CEC. Therefore, there are no responsible agencies for the CEQA review of the RTEP.

Trustee Agencies

The California Department of Fish and Wildlife is California's trustee agency for the state's fish, wildlife, and plant resources, and it may consider and comment on this Draft EIR in fulfillment of its duties.

Scoping Meeting

An online public scoping meeting will be conducted on **Monday, September 30, 2024, at 1:00 p.m. PST**. Anyone interested in participating in the scoping meeting will need to register using the following link:

https://events.teams.microsoft.com/event/e3c404e6-0f3a-4829-a526-f99e68c32709@f56a4539-2d8e-4b0d-8454-a64203aa39d3

You can also register using the QR code below.



To register for the meeting, you will need to provide a name and e-mail address. The e-mail address will be used to send you future notices related to the EIR.

Appendix C

Scoping Comments

DOCKETED	
Docket Number:	20-TIRE-01
Project Title:	Tire Efficiency Order Instituting Information Proceeding
TN #:	259571
Document Title:	Kendrick Mensink Comments - Items for EIR to investigate
Description:	N/A
Filer:	System
Organization:	Kendrick Mensink
Submitter Role:	Public Agency
Submission Date:	10/16/2024 5:12:08 PM
Docketed Date:	10/17/2024

Comment Received From: Kendrick Mensink
Submitted On: 10/16/2024
Docket Number: 20-TIRE-01

Items for EIR to investigate

Additional submitted attachment is included below.

I would advise the EIR to investigate

1) Direct impacts.

Consumer market will generally optimize towards lowest tire cost per mile. The tradeoffs of safety via reduced tire grip and of waste via wear particulate and bulk used tire life/mileage should be studied and quantified. California Air Resources Board has studies in-process to help inform these tradeoffs, see Brake & Tire Wear Emissions | California Air Resources Board. This government program should raise the efficiency threshold without compromising safety and minimizing waste. Consult with existing tire testing servicers to determine the environmental costs to tire manufacturers to implement their own testing. Perhaps tire manufacturers will use 3rd party testing servicers, and perhaps this should be a requirement to help ensure fairness, similar testing conditions, and reduce falsified tire ratings submitted to CEC efficiency database. Wear-rates for low rolling resistance tires should have metrics too. Wholistic tire efficiency must include the mileage life of a tire (bulk waste) as well as particulate wear waste. It wouldn't necessarily net benefit the state to have more fuel-efficient tires if tire-slip related accidents increase significantly and/or if used tire waste is generated at a significantly higher rate.

2) Indirect Impacts.

There may be a significant inventory of unsold replacement tires that will not meet the minimum efficiency requirements. Will a "black market" develop temporarily or permanently for subpar replacement tires and should that be explicitly prevented?

3) Alternatives Analysis.

The SWOT environmental impact comparison analysis of a state-managed tire testing facility/agency vs free market vs state-designated testing facilities that meet ISO and state testing requirements.

DOCKETED	
Docket Number:	20-TIRE-01
Project Title:	Tire Efficiency Order Instituting Information Proceeding
TN #:	259582
Document Title:	San Joaquin Valley Air Pollution Control District (SJVAPCD) CommentLetter for the NOP of a DEIR for the Replacement Tire Efficie
Description:	N/A
Filer:	System
Organization:	San Joaquin Valley Air Pollution Control District (SJVAPCD)
Submitter Role:	Public
Submission Date:	10/17/2024 1:34:15 PM
Docketed Date:	10/17/2024

Comment Received From: San Joaquin Valley Air Pollution Control District (SJVAPCD)
Submitted On: 10/17/2024
Docket Number: 20-TIRE-01

SJVAPCD Comment Letter for the NOP of a DEIR for the Replacement Tire Efficiency Program

Additional submitted attachment is included below.

San Joaquin Valley
AIR POLLUTION CONTROL DISTRICT

HEALTHY AIR LIVING™

October 17, 2024

California Energy Commission
Fuels and Transportation Division
1516 9th Street
Sacramento, CA 95814

Project: Notice of Preparation of a Draft Environmental Impact Report for the Replacement Tire Efficiency Program

District CEQA Reference No: 20241105

To Whom It May Concern:

The San Joaquin Valley Air Pollution Control District (District) has reviewed the Notice of Preparation (NOP) of a Draft Environmental Impact Report (DEIR) from the California Energy Commission (CEC) for the Replacement Tire Efficiency Program (RTEP). Per the NOP, the project consists of a program and regulations designed to ensure that replacement tires sold in California are, to the extent feasible, at least as energy efficient as the tires sold as original equipment on passenger cars and light-duty trucks through the establishment of minimum performance standards (Project). The RTEP would be applicable to the entire state of California.

The District offers the following comments at this time regarding the Project:

1) Project Related Emissions

At the federal level under the National Ambient Air Quality Standards (NAAQS), the District is designated as extreme nonattainment for the 8-hour ozone standards and serious nonattainment for the particulate matter less than 2.5 microns in size (PM2.5) standards. At the state level under California Ambient Air Quality Standards (CAAQS), the District is designated as nonattainment for the 8-hour ozone, PM10, and PM2.5 standards.

The District understands that the RTEP is a regulation-level project. If there are future development projects, development project construction and operational air emissions should be characterized. The District recommends the air emissions be compared to the District significance thresholds as identified in the District's Guidance for Assessing and Mitigating Air Quality Impacts: https://ww2.valleyair.org/media/g4nl3p0g/gamaqi.pdf.

Samir Sheikh
Executive Director/Air Pollution Control Officer

Northern Region
4800 Enterprise Way
Modesto, CA 95356-8718
Tel: (209) 557-6400 FAX: (209) 557-6475

Central Region (Main Office)
1990 E. Gettysburg Avenue
Fresno, CA 93726-0244
Tel: (559) 230-6000 FAX: (559) 230-6061

Southern Region
34946 Flyover Court
Bakersfield, CA 93308-9725
Tel: (661) 392-5500 FAX: (661) 392-5585

www.valleyair.org www.healthyairliving.com

Printed on recycled paper.

The District recommends that future development projects be mitigated to the extent feasible, and that future projects with air emissions above the aforementioned thresholds be mitigated to below these thresholds.

Environmental reviews of potential impacts on air quality should incorporate the following items:

1a) Construction Emissions

The District recommends for future development projects, to reduce impacts from construction-related diesel exhaust emissions. Future development projects should utilize the cleanest available off-road construction equipment.

1b) Operational Emissions

The District recommends for future development projects, operational (ongoing) air emissions from mobile sources and stationary sources should be analyzed separately. For reference, the District's significance thresholds are identified in the District's Guidance for Assessing and Mitigating Air Quality Impacts: https://ww2.valleyair.org/media/g4nl3p0g/gamaqi.pdf.

Recommended Mitigation Measure: At a minimum, project related impacts on air quality should be reduced to levels below the District's significance thresholds through incorporation of design elements such as the use of cleaner Heavy Heavy-Duty (HHD) trucks and vehicles, measures that reduce Vehicle Miles Traveled (VMTs), and measures that increase energy efficiency. More information on transportation mitigation measures can be found at: https://ww2.valleyair.org/media/ob0pweru/clean-air-measures.pdf

1c) Recommended Model for Quantifying Air Emissions

Future development project related criteria pollutant emissions from construction and operational sources should be identified and quantified. Emissions analysis should be performed using the California Emission Estimator Model (CalEEMod), which uses the most recent CARB-approved version of relevant emissions models and emission factors. CalEEMod is available to the public and can be downloaded from the CalEEMod website at: www.caleemod.com.

2) District Rules and Regulations

The District issues permits for many types of air pollution sources, and regulates some activities that do not require permits. A project subject to District rules and regulations would reduce its impacts on air quality through compliance with the District's regulatory framework. In general, a regulation is a collection of individual

rules, each of which deals with a specific topic. As an example, Regulation II (Permits) includes District Rule 2010 (Permits Required), Rule 2201 (New and Modified Stationary Source Review), Rule 2520 (Federally Mandated Operating Permits), and several other rules pertaining to District permitting requirements and processes.

The list of rules below is neither exhaustive nor exclusive. Current District rules can be found online at: https://ww2.valleyair.org/rules-and-planning/current-district-rules-and-regulations. To identify other District rules or regulations that apply to future projects, or to obtain information about District permit requirements, the project proponents are strongly encouraged to contact the District's Small Business Assistance (SBA) Office at (559) 230-5888.

2a) District Rules 2010 and 2201 - Air Quality Permitting for Stationary Sources

Stationary Source emissions include any building, structure, facility, or installation which emits or may emit any affected pollutant directly or as a fugitive emission. District Rule 2010 (Permits Required) requires operators of emission sources to obtain an Authority to Construct (ATC) and Permit to Operate (PTO) from the District. District Rule 2201 (New and Modified Stationary Source Review) requires that new and modified stationary sources of emissions mitigate their emissions using Best Available Control Technology (BACT).

Future development projects may be subject to District Rule 2010 (Permits Required) and Rule 2201 (New and Modified Stationary Source Review) and may require District permits. Prior to construction, project proponents shall obtain an ATC permit from the District for equipment/activities subject to District permitting requirements.

Recommended Mitigation Measure: For projects subject to permitting by the San Joaquin Valley Air Pollution Control District, demonstration of compliance with District Rule 2201 (obtain ATC permit from the District) shall be provided to the CEC before issuance of the first building permit.

For further information or assistance, project proponents may contact the District's SBA Office at (559) 230-5888.

If you have any questions or require further information, please contact Dylan Casares by e-mail at Dylan.Casares@valleyair.org or by phone at (559) 230-6574.

Sincerely,

Tom Jordan
Director of Policy and Government Affairs



For: Mark Montelongo
Program Manager

Appendix D

Rolling Resistance and Tire Technology

Report

23-1009841BS Rolling Resistance and Tire Technology

Prepared for:

Aspen Environmental Group

Prepared to support the Environmental Impact Report for the California Replacement Tire Efficiency Program.

For the attention of:
Jon Davidson
5020 Chesebro Rd Suite 200

Agoura Hills, CA 91301

December 10, 2024

Reference: 23-1009841BS

Bradley Sellers
Consultant
Technical Consulting
Smithers MSE

Bruce Lambillotte
Senior Project Manager
Technical Consulting
Smithers MSE

Joshua Guilliams
Vice President
Technical Consulting
Smithers MSE

Rolling Resistance and Tire Technology

Page

Introduction..... 3

Background: Rolling Resistance..... 3

Energy Losses..... 4

- Energy Losses in Vehicles: Macro Perspective..... 4
- Energy Losses in Tires: Macro Perspective..... 4
- Energy Losses in Tire Areas: Structural Regional Perspective..... 5
- Viscoelasticity and Hysteresis..... 6

Rolling Resistance and Other Criteria..... 6

- Rolling Resistance and Tire Traction..... 6
- Rolling Resistance and Tire Treadwear..... 8
- Rolling Resistance and Tire Noise..... 10
- Rolling Resistance and Tire Lightweighting..... 10
- Rolling Resistance and Antidegradant Usage..... 11

Benchmarking..... 11

- Fuel Economy Testing..... 11
- Rolling Resistance Testing..... 12
- Dynamic Mechanical Testing..... 12

Trends in Reducing Rolling Resistance..... 13

- Product Development Tools..... 13
- Tire Construction..... 13
- Tire Pressure..... 13
- Tire Compounding and Materials..... 14

Sources..... 15

Appendix..... 16

Introduction:

The intent of this paper is to discuss tire rolling resistance, and how tire technology influences this energy loss phenomenon. Rolling resistance is first defined and then characterized relative to overall vehicle energy losses, the whole-tire perspective, and then with respect to individual regions of the tire. The concepts of viscoelasticity and hysteresis are introduced. The study next proceeds to examine the correlations between rolling resistance and several other tire performances and characteristics. The paper goes on to address tire and rubber testing from a rolling resistance and hysteresis benchmarking perspective; and then closes with a discussion of types of development work that can be associated with efforts to reduce tire rolling resistance.

This report has been prepared to support the Environmental Impact Report for the California Replacement Tire Efficiency Program, being developed by the California Energy Commission.

Background: Rolling Resistance

Tire rolling resistance is defined as “the force required to maintain the forward movement of a loaded pneumatic tire in a straight line at a constant speed. (It) is caused by the natural viscoelastic properties of rubber along with the tire's internal components constantly bending, stretching and recovering as they cycle between their loaded (where the tread footprint flattens against the road) and unloaded states. The final contributor to tire rolling resistance is the tread's interaction with the road.”[1]

Vehicle manufacturers and government began to significantly increase focus of attention upon light vehicle fuel efficiency and the role of tire rolling resistance during the mid-1970s in response to an oil embargo created by the Organization of Petroleum Exporting Countries. “At that time, new cars sold in the United States averaged less than 16 mpg. As gasoline prices jumped by more than 25 percent within months, motorists and policy makers focused their attention on energy conservation for the first time since World War II. During the decade that followed—which included further jumps

in gasoline and diesel fuel prices—the average fuel economy of new vehicles grew by more than 50 percent (MPG increase)"[2]

Perhaps the most significant program originating from that period was the corporate average fuel economy (CAFE) program. For the first time, Congress established fuel economy standards for passenger cars and light trucks. The program, administered by the National Highway Traffic Safety Administration (NHTSA), mandated a sales-weighted average fuel economy for different vehicle categories produced by all automobile manufacturers. Each vehicle's rating would be determined by EPA's city and highway driving tests developed originally for emissions testing and certification.[2]

Energy Losses

Energy Losses in Vehicles: Macro Perspective

Engine/drivetrain energy consumption in internal combustion engine (ICE) vehicles, on a macroscale, ranges from 72-84% of the original inputted fuel energy. These usages are attributable to engine operation, friction losses, drive train losses, parasitic losses, auxiliary electrical applications and idling. The remaining 16-25% of the original fuel energy is delivered to the wheels, and is used to overcome aerodynamic drag, rolling resistance and braking requirements.[3] Rolling resistance accounts for about 4-7% of original input fuel energy content. These percentages are influenced by engine type, transmission type, vehicle design and many other vehicle variables. From a vehicle manufacturer's standpoint, reduced vehicle weight, improvements in drive train efficiency and lower aerodynamic drag represent areas of focus for improved fuel economy. From a vehicle owner's perspective, maintenance of proper tire inflation and proper wheel alignment are two key opportunities for the driver to beneficially influence tire-related rolling resistance. It has been reported that each drop of 1 psi leads to a 1.4 percent increase in rolling resistance.[2]

Energy Losses in Tires: Macro Perspective

The most significant step in reducing tire rolling resistance occurred during the period late 1960s to early 1980s, at which time the transition from bias construction of the light vehicle tire casing to radial occurred. “In addition to affecting tire handling, endurance, and ride comfort, the changeover from bias-ply to radial-ply tires during the 1970s and 1980s reduced tire rolling resistance by an estimated 25 percent”[2]

Overall product design in terms of tire height, tire width and outside diameter can influence rolling resistance. Short height tires with narrow widths and high outside diameters tires are directionally beneficial for rolling resistance, However, these attributes are not optimum for treadwear, wet traction (especially hydroplaning), dry traction, minimization of braking distances, impact damage resistance or subjective tire appearance. Modern light vehicle tires are frequently designed with 1) lower aspect ratios (height-to-width ratio of the tire cross section) than were historically used, and 2) generally higher bead diameters than were historically used. Reduced aspect ratios benefit reduced rolling resistance by reducing sidewall height, and thus feature a narrower zone for tire flexing energy losses. The large bead diameter benefits tire rolling resistance and also permits installation of larger vehicle braking systems. The wide tread trend does not work in the direction of minimizing rolling resistance but does benefit wear resistance and traction.

Tire rolling resistance drops with declining tread mass. It has been reported that “experiments (have) suggested that rolling resistance decline by 26 percent over the entire wear life.”[2]

Energy Losses in Tire Structural Areas: Regional Perspective

Energy losses within tires may also be examined on a “regional” scale. Frequently the categories used for this type of investigation include the tread area, sidewalls and tire bead regions. The tread area may account for approximately 50-70% of the total rolling force losses in rolling resistance. Sidewalls may account for 20-35% of tire energy losses, and the beads contribute the remaining 10-15%.

Energy losses in treads may be associated with the constituent rubber compound properties, especially the hysteresis of the tread cap and subtread rubber components. Reduced hysteresis can be used as a tool to lower tire rolling resistance. The energy loss ratio is quantifiable in a physical test laboratory and may be determined in tension or in shear. Hysteretic energy losses in the sidewall component and the rubber components of the beads (rimstrips, chafers, bead insulation) may also be used to study rubber property impacts upon total tire rolling resistance.

Design and engineering factors of the tread, sidewalls and bead areas additionally impact tire rolling resistance. The dimensions of the tire tread, including width and nonskid depth, total depth, tread pattern, contact ratio, footprint pressure distribution and tread mass can also influence tread area energy losses that contribute to tire rolling resistance.

Other key tire rubber components for consideration in minimizing energy losses include innerliners and reinforcing ply skims (rubber laminates encapsulating reinforcing ply cord layers).

The quantitative impacts of changes in the tire areas discussed above can be difficult to predict and must ultimately be judged with whole tire rolling resistance testing.

Viscoelasticity and Hysteresis

In viewing the tire product from an individual tire component composition standpoint, the highly elastic nature of rubber combined with its strength, toughness, resilience and fatigue resistance make it an obvious choice for the pneumatic tire application. However, the viscoelastic nature of rubber: the ability to exhibit a response which resembles that of an elastic solid under some circumstances, while under others it can act as a viscous liquid, can permit energy losses. The mechanical energy loss associated with each cycle of deformation and recovery is known as hysteresis. “The main contributor to rolling resistance is the process known as hysteresis. Hysteresis is essentially the energy loss that occurs as a tire rolls through its footprint.”[4] Reductions in tire component hysteresis can lead to reduced rolling resistance.

Hysteresis data generated in the laboratory refers to a ratio representing the flexing energy loss due to internal friction and viscous heat generation as a function of total flexing energy input.

Common tools used to reduce hysteresis in light vehicle tread compounds include solution styrene butadiene rubber (SBR) polymers, polybutadiene polymers, silica replacing part or most of the carbon black and optimized vulcanization chemicals.

Rolling Resistance and Other Criteria

Rolling Resistance and Tire Traction

Traction is a tire performance criterion that is associated with safety and that focuses upon resistance and friction at the tire-ground interface to prevent sliding. It is needed for vehicle control forces: steering, braking and acceleration. It may pertain to dry, wet, muddy, snowy or icy surfaces and require tire width, tread pattern and/or tread compound optimizations for each different surface condition. Most of the different tread pattern features function to enhance one or more surface condition types of traction. For example: major grooves and slots can help evacuate water from the footprint area, lateral sipes can provide biting edges for improved snow traction, and deep tread elements can benefit traction in both water and snow.

The viscoelastic properties of an elastomer have been shown to play a dominating role in the friction of tire tread compounds.[5] Tread compounding for traction generally includes the following example considerations:

- low glass transition temperature polymers for snow and ice traction
- high glass transition temperature, high hysteresis polymers for dry traction
- increased low strain modulus (hardness) for wet traction and hydroplaning resistance
- low hardness for snow and ice traction

Unfortunately, grip or traction is a tire performance criterion that may be expected to conflict with rolling resistance. It represents a vertex of the “magic triangle” of three

major performance parameters (treadwear, wet traction and rolling resistance) that must be balanced to meet overall objectives for each tire design. Fortunately, tire developments for original equipment vehicle applications have historically stressed dual emphasis upon both wet traction and rolling resistance. It should also be noted that original equipment (OE) tire development additionally tends to serve as a technology driver for the replacement light vehicle tire market.

Correlating potential tradeoffs between rolling resistance and traction tend to lead to weak R^2 correlation coefficients (see note below). R^2 correlation coefficients by tire market type from the "Summary of Tire Testing for California's Replacement Tire Efficiency Program, per Assembly Bill 844 January 2023" are noted below.[6]

	All Terrain	Economy	Fuel Efficient	Highway	Touring	UHP
Rolling Resistance vs. Traction; Correlation Quality: R^2	<0.500	<0.500	<0.500	<0.500	<0.500	<0.500
Direction of Fitted Line Correlation	wet grip increased with declining rolling resistance	wet grip increased with declining rolling resistance	wet grip increased with declining rolling resistance	wet grip increased with declining rolling resistance	wet grip increased with declining rolling resistance	No slope

Note

Best-fit linear trendlines from tire tests were created to identify R^2 values for each correlation studied. R^2 is an indicator of "goodness of fit" of the linear trendline by measuring the proportion of variation in the dependent variable that can be attributed to the independent variable. The R-squared value R^2 is always between 0 and 1 inclusive. An R^2 value of <.50 would be considered weak. Slopes of the trendlines may be interpreted as follows:

1. A trend line with a positive slope indicates a positive correlation between the variables.
2. A trend line with a negative slope indicates a negative correlation between the two variables.

The steepness of the slope of a trendlines represents the sensitivity of the dependent variable (frequently rolling resistance or traction responses plotted along the Y-axis) to changes in the independent variable (plotted along X-axis).

For example, a trendline with a relatively high R^2 value and a steep positive slope suggests a correlation with a reasonable linear fit to the actual data results, a positive correlation between the dependent and independent variables and a strong sensitivity in the dependent variable to changes in the independent variable.

Rolling Resistance and Tire Treadwear

Treadwear resistance is another tire performance criterion that may be expected to conflict with rolling resistance. It represents another vertex of the “magic triangle” of three major performance parameters (treadwear, wet traction and rolling resistance) that must be balanced in all tire designs. In the original equipment tire market, high emphasis upon wet traction and rolling resistance by vehicle manufacturers can commonly result in compromises in treadwear resistance, and the magnitude of these compromises may be in the 10-25% range. In the replacement tire marketplace, consumers generally tend to place higher emphasis upon treadwear claims, and treadwear becomes a competitive issue in tire purchases.

Challenges to balancing tire treadwear and rolling resistance performances may be found in both tire engineering and tread compounding factors. Tire engineering examples include:

Feature	Treadwear Resistance	Rolling Resistance
Increased tread skid depth	improvement	concession
Increased tread width	improvement	concession
Increased % contact area in footprint	improvement	concession

Tire tread compounding examples include:

Feature	Treadwear Resistance	Rolling Resistance
Reduced tread compound hysteresis	likely concession	improvement
Introduction of low hysteresis subtread	likely concession	improvement

Treadwear resistance differences between tires, even similar tires, are difficult to benchmark. Tools available to the consumer are commonly limited to Uniform Tire Quality Grading (UTQG) ratings and tire manufacturers’ treadwear warranties. Uniform Tire Quality Grading Treadwear Rating is identified by tire stamping on sidewall; example UTQG rating: 560 A B; 560 is treadwear rating. The rating is a numeric index of how well a tire wears in comparison to a reference tire.

Although the UTQG test and ratings offer several benefits including:

- available for all SKUs in the California marketplace
- already documented; easily found on tire
- sanctioned by NHTSA (49CFR 575.104)
- on-vehicle test protocol based upon performance on a fixed course with a detailed procedure
- overstated mileage claims are avoided by federally imposed regulation

The system is negatively impacted by several concerns that lead to limited usefulness to the consumer:

- treadwear grade labels may not reflect actual UTQG test results, and may be understated
- UTQG grade labels are influenced by manufacturer marketing objectives
- UTQG (San Angelo) test course may not relate to actual roads/environment of usage

Likewise, tire manufacturer warranties offer some benefits:

- warranties are available for many SKUs (but not all)
- warranties can be sourced in tire manufacturer marketing literature
- overstated mileage claims are avoided by cost penalties to manufacturer

However, the treadwear warranty system is also negatively impacted by some concerns

- not available for all SKUs
- influenced by tire manufacturer marketing objectives

Although treadwear is likely to be negatively impacted by increased emphasis upon tire rolling resistance, quantifying the impact is challenging for the reasons discussed above. Attempts to correlate rolling resistance with treadwear by tire market category indicated by the R^2 correlation coefficients are shown below.[6]

	All Terrain	Economy	Fuel Efficient	Highway	Touring	UHP
UTQG Treadwear Grade vs Rolling Resistance; Correlation Quality: R^2	<0.500	0.528	0.660	<0.500	<0.500	<0.500
Direction of Fitted Line Correlation	Wear resistance declined with declining rolling resistance	Wear resistance declined with declining rolling resistance	Wear resistance declined with declining rolling resistance	Wear resistance declined with declining rolling resistance	Wear resistance declined with declining rolling resistance	Wear resistance increasing with declining rolling resistance

Rolling Resistance and Tire Noise

The impact of tire tread compound modification(s) to reduce rolling resistance may be considered from the perspective of lowering the compound hysteresis as indicated by a reduction in tangent delta and measured by laboratory dynamic mechanical testing. Reduced tangent delta is expected to directionally improve rolling resistance but make the compound less damping. A less damping compound may increase noise transmission to the air. Compound modulus or stiffness may also influence the damping, and the designed pattern of the tread has a major impact upon noise generation.

Although many original equipment tires are designed with reduced rolling resistance treads to permit achievement of federal Corporate Average Fuel Economy (CAFE) requirements, OE tire treads have also commonly been designed for reduced noise. Thus, reduced hysteresis does not have to be indicative of a noisier tire. An increase in reduced hysteresis tread usage for replacement market tires would not be expected to generate more road noise.

Rolling Resistance and Tire Lightweighting

Lightweighting refers to minimizing tire weight, while maintaining competitive wear resistance and durability. Reductions in tire weight, especially associated with lowering the masses (usually by reducing component thicknesses) of the viscoelastic rubber components in the tread and sidewall areas reduce energy losses, and thus rolling

resistance. This type of effort can best be studied by benchmarking a range of like size and type tires from the marketplace and identifying best practice examples of rubber component mass reductions. This type of work can be conducted while maintaining load carrying capacity capabilities and rated speed capabilities. Examples of component mass reductions include reduced tread thicknesses under the grooves, thinner sidewalls and reduced thickness innerliners.

An investigation conducted by Smithers that studied tires of like size within five different market types of passenger tires indicated weight differences ranging from 8.2% to 11.5%, after comparing the lightest tire weight to the average tire weight for each market type group. An example of lightweighting may be found in Bridgestone light vehicle tires that feature Enliten®, “a new innovative lightweight tyre technology that represents an unmatchable reduction in material and rolling resistance performance to contribute to the reduction of a vehicle’s CO2 emissions.”[7]

If lowering rolling resistance is achieved by lightweighting only the tread with reduced skid depth, holding all else equal, tire replacements would become more frequent due to reduced tread life.

Rolling Resistance and Antidegradant Usage

Virtually all global light vehicle tires are designed with compounds featuring styrene butadiene rubber and/or natural rubber and/or polybutadiene base polymers. These base polymers can provide higher strength, toughness, abrasion resistance, and resilience for tread service than virtually any other commercial base rubber polymers. However, all three have a common characteristic: polymer unsaturation, that enables damage from ozone and oxygen exposures. Chemical protection compounded into the tread formulations is required for retention of the performance benefits throughout the life of the tire product. Presently, the most commonly used chemical antidegradant for this purpose is *N*-(1,3-dimethylbutyl)-*N′*-phenyl-*p*-phenylenediamine, better known commercially as 6PPD. “6PPD is an antioxidant and antiozonant that helps prevent the degradation and cracking of rubber compounds caused by exposure to oxygen, ozone and temperature fluctuation.”[8] It (6PPD) has been the subject of increasing scrutiny

since 2020, when it was determined that its quinone oxidation product (6PPD-Q) causes pre-spawn mortality in coho salmon.[9] All major tire manufacturers are thought to have initiated work to search for alternatives to the ubiquitous 6PPD antidegradant.

A study conducted by one independent rubber testing laboratory and reported at the 2024 Tire Technology Expo in Hannover, Germany regarding a reported relationship between 6PPD and silica reinforcing filler usage has led to the question of whether lower rolling resistance treads might result in increased 6PPD-Q release into the environment. As previously noted, increased silica usage is a common tool to reduce carbon black content and achieve reduced hysteresis tread compounds. As yet there has been no public release of supporting documentation for this claim. Until and unless validation becomes available, the impact of silica usage upon 6PPD-Q release remains to be determined.

Increased usage levels of 6PPD beyond typical requirements for ozone resistance, oxygen resistance and heat resistance do not significantly impact rolling resistance, treadwear or traction.

It should be noted that increased 6PPD-Q could be released if increasing treadwear rates in low rolling resistance replacement tires ensue.

Benchmarking

Vehicle Fuel Economy Testing

The impact of rolling resistance upon fuel economy can be studied directly with on-vehicle benchmarking tests of tire applications correlated with fuel consumed. Vehicles are typically fitted with precisely graduated and labeled mini-fuel tanks for this type of work. Many challenging variables remain in play during fuel consumption testing: driver changes, vehicle-to-vehicle variability, winds, rain, etc. Fortunately, direct rolling resistance testing of tires on dynamometers fitted with load, speed and inflation-sensitive equipment serves as a practical alternative. Indeed, rolling resistance testing is one of the most reproducible of dynamic, whole-tire test protocols.

Tire Rolling Resistance Testing

Work authorized by the California Energy Commission and conducted during the 2000's concluded that ISO 28580 "Passenger Car, Truck and Bus Tyre Rolling Resistance Measurement Method — Single Point Test and Correlation of Measurement Results" was an appropriate test protocol for determining tire rolling resistance forces. ISO 28580:2018 specifies methods for measuring rolling resistance, under controlled laboratory conditions, for new pneumatic tires designed primarily for use on passenger cars, trucks and buses. Measurement of tires using this method enables comparisons to be made between the rolling resistance of new test tires when they are free-rolling straight ahead, in a position perpendicular to the drum outer surface, and in steady-state conditions.[10] Tire rolling resistance forces are quantified with the test and normalized by test loads to yield rolling resistance coefficients (RRc) which permit comparisons between different tire designs and different efficiencies. This is a useful tool because hysteresis increases with wheel load, and high data volume comparisons that had to be made only with rolling forces would be very onerous.

Dynamic Mechanical Testing

"Dynamic mechanical analysis (DMA) measures the mechanical properties of polymeric materials as a function of temperature, time, frequency, stress, or a combination of these parameters. The usual outputs of DMA are Elastic or Storage (E') and Loss (E") moduli as a function of frequency and temperature. The ratio between storage and loss modulus produces a response curve known as tan delta (also called damping), which is a measure of the energy dissipation of a material. For cross-linked polymers, the glass transition temperature, Tg, is easily measured using DMA.[11]

Trends in Reducing Tire Rolling Resistance

Product Development Tools

- application of tools to study hysteresis in tire component compounds and energy loss as heat in tires

  - use of dynamic mechanical analysis to study dynamic stiffness and energy losses in tire component compounds
  - use of finite element analysis techniques to study shear energy concentration reductions in tires
  - use of thermography to study energy reduction via heat reduction in tires

Tire Construction

- tread depth optimization studies
  - “a tire manufacturer can reduce tread depth to improve rolling resistance. However, there will be a corresponding reduction in tire wear life. To overcome this tradeoff, new technology could be designed to maintain the wear performance, while still improving rolling resistance.”[4] Reduced tread skid depth will also very likely reduce wet traction.
- lightweighting of tire components
- introduce low hysteresis subtread in tires not currently featuring this technology
- introduce reduced weight, high diffusion resistance innerliners in tires not featuring this technology
- study the effects tire components/compounds in respect to aerodynamic effects that might impede rolling resistance.

Tire Pressure

- The light vehicle operator or fleet owner also has an important measure of responsibility with respect to the maintenance of optimal tire inflation pressure to reduce rolling resistance, while benefitting braking, traction, tire life, and CO2 reduction:
  - 1% - 2% decrease in fuel consumption
  - 7% decrease in braking distance
  - 8% increase in tire life
  - 8 million tons of CO2 saved per year nationally12
- Consumers tend to be unaware that average tire air pressure loss is 2.4% per month[12].

Tire Compounding and Materials

- evaluations of new solution styrene butadiene rubber (SSBR) polymer technologies in treads
    - studies of new functionalized SSBRs
    - technology investigations involving coupling agent attached to the backbone of the polymer to further benefit RRC and wet traction
    - studies looking at higher molecular weight SSBRs that may allow for enhanced wear performance while maintaining rolling resistance
    - studies of optimized styrene and vinyl contents of the polymer to enhance traction while maintaining rolling resistance
- evaluations of new resins that can provide benefits to wet traction and RRC performance.
- evaluations of new polybutadiene rubber (BR) polymer technologies
    - studies of neodymium (ND) catalyst usage both tread and sidewall applications.
    - optimization of ND catalysis to achieve improved rolling resistance coefficients over other conventional ND-based technology
- natural rubber usage: optimization or potential for more usage of NR for tread applications for RRC/wear balance.
- evaluations of silica filler technologies
    - studies of higher loadings of silica (over 100 PHR) along with higher surface areas for additional performance
    - silica technology usage in other parts of the tire: sidewalls and subtread components
    - studies of new highly dispersible varieties of silica fillers
- evaluations of new filler coupling agent technologies
    - optimized silane coupling agent loadings commensurate with increased silica usage
    - new coupling agent technologies, especially for high performance tires
- new tread reinforcing filler technologies that are more durable than current filler technologies and can provide tire lightweighting

These current and future tools for reducing rolling resistance are repeated below to provide considerations of benefits and environmental impact comments:

Category	Development	Benefits	Environmental Impacts
Product Development Tools	Use of dynamic mechanical analysis to study dynamic stiffness and energy losses in tire component compounds	Benchmarking dynamic properties, including rubber hysteresis	No effect
	Use of finite element analysis techniques to understand dynamic modulus/static modulus values in regards energy reductions in tires.	Tire development modeling to reduce rolling resistance	No effect
	Use of thermography to study energy reduction via heat reduction in tires	Quantitate thermal energy losses for tire development	No effect
Tire Construction	Tread depth optimization studies	Minimize tread depth to reduce tread weight and RRC.	May increase tire usage turnover. Tires tend to wear fastest during early tread life.
	Lightweighting of tire components	Reduced tire mass to lower rolling resistance while maintaining durability.	No effect
	Introduce low hysteresis subtread in tires not currently featuring this technology	Reduced hysteresis tread base for reduced rolling resistance.	No expected effect unless treadwear rate is increased.
	Introduce reduced weight, high diffusion resistance innerliners in tires not featuring this technology	Reduced tire mass for lower rolling resistance while maintaining durability	No expected effect.
	Tire Construction Optimization	Studying the effects tire components/compounds in respect to aerodynamic effects that might impede rolling resistance.	May need tire builds conducted to verify the modeling effects of these tires.

Category	Development	Benefits	Environmental Impacts
New Materials: Solution SBRs	New solution styrene butadiene rubber (SSBR) polymer technologies in treads	Reduced RRC and improved wet traction	No expected effect unless treadwear rate is increased.
	Higher molecular weight SSBRS	Enhanced wear performance while maintaining rolling resistance	No expected effect unless treadwear rate is increased.
	Optimized styrene and vinyl contents of the SSBR polymer to enhance traction while maintaining rolling resistance	Enhanced traction while maintaining rolling resistance	No expected effect unless treadwear rate is increased.
	Coupling agent attached to the backbone of SSBR polymer	Reduced RRCs and increased wet traction	No expected effect unless treadwear rate is increased.
New Materials: Resins	Resin technologies that can provide benefits to wet traction and RRC performance.	Reduced RRC and increased wet traction performance	No expected effect unless treadwear rate is increased.
New Materials: Polybutadienes	Optimization of neodymium (ND) catalyst usage in polybutadienes: both tread and sidewall applications.	Improved rolling resistance coefficients over other conventional ND-based BRs	RRC is improved with less fuel consumption. No expected effect unless treadwear rate is increased.
	Development of new neodymium catalysts	Improved rolling resistance coefficients over other conventional ND-based BRs	RRC is improved with less fuel consumption. No expected effect unless treadwear rate is increased.
Natural Rubber Usage	Optimization or potential for more usage of NR for tread applications for RRC/Wear balance.	Improve rolling resistance	Potential improvement in environmental effect in terms of lower RRC. May increase treadwear rate.

Category	Development	Benefits	Environmental Impacts
New Materials: Advanced Silica Technologies	Higher loadings of silica (over 100 PHR) along with higher surface areas	Reduced RRC and improved wet traction	No expected effect unless treadwear rate is increased.
	Silica technology expansion into other parts of the tire; examples: sidewalls and subtread	Potential for reduced RRCs	No expected effect unless treadwear rate is increased.
	New highly dispersible varieties of silica fillers	Potential for reduced RRCs	No expected effect unless treadwear rate is increased.
New Filler Coupling Agent Technologies	Optimized silane coupling agent loadings commensurate with increased silica usage	Reduced RRCs	No expected effect unless treadwear rate is increased.
	New coupling agent technologies, especially for high performance tires	Potential for reduced RRCs	No expected effect unless treadwear rate is increased.
New reinforcing filler materials for treads	New filler technologies that are more durable than current filler technologies and can provide tire lightweighting	Potential for reduced RRCs	No expected effect unless treadwear rate is increased.

Sources

1. Tire Rack; https://www.tirerack.com/upgrade-garage/what-is-tire-rolling-resistance-defining-rolling-resistance?gclid=EAIaIQobChMIyv2yyf6NiAMV9UL_AR34rRM6EAMYASAAEgJ8jvD_BwE&ef_id=EAIaIQobChMIyv2yyf6NiAMV9UL_AR34rRM6EAMYASAAEgJ8jvD_BwE:G:s&s_kwcid=AL!3756!3!!!x!!&gclsrc=aw.ds&gad_source=1

2. National Academies of Sciences, Engineering, and Medicine. 2006. Tires and Passenger Vehicle Fuel Economy: Informing Consumers, Improving Performance -- Special Report 286. Washington, DC: The National Academies Press. https://doi.org/10.17226/11620.

3. “Where the Energy Goes: Gasoline Vehicles” https://www.fueleconomy.gov/feg/atv.shtml;

4. Bridgestone; https://www.bridgestonetire.com/learn/tire-technology/tire-rolling-resistance/

5. US Department of Transportation; National Highway and Traffic Administration; DOT HS 810 561; The Pneumatic Tire

6. Summary of Tire Testing for California’s Replacement Tire Efficiency Program, per Assembly Bill 844. Smithers MSE. March 2023

7. https://www.csrwire.com/press_releases/42170-bridgestone-introduces-enliten-a-new-lightweight-tyre-technology-that-requires-less-materials-and-cuts-co2-emissions

8. “SUPPORTING RESEARCH INTO 6PPD AND 6PPD-QUINONE” USTMA; www.ustires.org/sites/default/files/2022-05/USTMA-6PPD-0526_0.pdf

9. Chadwick, Julie (12 July 2024). "How researchers uncovered the coho killing tire toxin 6PPD-Q". The Discourse. 26 July 2024

10. ISO 28580:2018 “Passenger Car, Truck and Bus Tyre Rolling Resistance Measurement Method — Single Point Test and Correlation of Measurement

11. DMA Testing - Dynamic Mechanical Analysis; Smithers https://www.smithers.com/industries/materials/polymer/physical-testing/material-properties-testing/dma-testing

12. www.exxonmobilchemical.com/en/resources/library/library-detail/2880/iplr_regulatory_sheet_butyl_rubber_en

Appendix

Definitions

Aspect ratio. A tire's section height divided by its section width, multiplied by 100. Aspect ratio is listed in the size designation on the passenger tire sidewall. Typical tire aspect ratios range from 35 for tires used on sports cars to 75 for tires used on utility-type vehicles.

Bead. A ring of steel wire that anchors the tire carcass plies to the rim.

Belt. An assembly of plies extending from shoulder to shoulder of a tire and providing a reinforcing foundation for the tread. In radial-ply tires, the belts are typically reinforced with fine steel wire having high tensile strength.

Bias-ply tire. A pneumatic tire in which the ply cords that extend to the beads are laid at alternate angles substantially less than 90 degrees to the centerline of the tread. The bias-ply tire was the predominant passenger tire in the United States before 1980 but is no longer in common use; it has been supplanted by the radial-ply tire.

Carbon black. A very fine, nano-size particulate carbon used as a reinforcing filler in rubber compounds to provide abrasion resistance and other favorable properties.

Carcass or casing. The tire structure, except tread and sidewall rubber, that bears the load when the tire is inflated.

Coastdown. A process in which a vehicle or test machine is allowed to slow down freely from a high to a low speed without application of external power or braking.

Coefficient of friction. The ratio of friction force to normal force to cause sliding expressed as a unitless value (i.e., friction force generated between tire tread rubber and the road surface divided by vertical load).

Corporate average fuel economy (CAFE). A federal program that sets a minimum performance requirement for passenger vehicle fuel economy. Each automobile manufacturer must achieve an average level of fuel economy for all specified vehicles manufactured in a given model year. The National Highway Traffic Safety Administration administers the CAFE program. The U.S. Environmental Protection Agency develops the vehicle fuel economy test procedures.

EPA. U.S. Environmental Protection Agency. EPA is responsible for developing the federal test procedures for measuring and rating the fuel economy of new passenger cars and light trucks. The federal test procedures are used for new vehicle fuel economy labeling and the corporate average fuel economy program.

FMVSS. Federal Motor Vehicle Safety Standards. The FMVSS include regulations governing passenger tire safety.

High-performance tire. A passenger tire designed for the highest speed and handling, generally having the speed symbol W, Y, or Z in the United States.

Hysteresis. A characteristic of a deformable material such that the energy of deformation is greater than the energy of recovery. The rubber compound in a tire exhibits hysteresis. As the tire rotates under the weight of the vehicle, it experiences repeated cycles of deformation and recovery, and it dissipates the hysteresis energy loss as heat. Hysteresis is the main cause of energy loss associated with rolling resistance and is attributed to the viscoelastic characteristics of the rubber.

Light truck (LT) tire. A tire constructed for heavy loads and rough terrain that is usually used on medium-duty trucks in commercial service. These tires contain the prefix LT before the metric size designation molded on the tire sidewall and are inflated to higher pressures than are normal passenger tires.

NHTSA. National Highway Traffic Safety Administration. Among its responsibilities, NHTSA administers the Federal Motor Vehicle Safety Standards, the Uniform Tire Quality Grading system, and the corporate average fuel economy program.

Original equipment manufacturer (OEM). An automobile manufacturer.

Original equipment (OE) passenger tire. A tire that is provided as original equipment on new passenger vehicles. Such tires are often designed for particular vehicles to the specifications of the automobile manufacturer.

Passenger tire. A tire constructed and approved for use on passenger vehicles and that usually contains the prefix P before the metric size designation on the tire sidewall. Federal Motor Vehicle Safety Standards and Uniform Tire Quality Grading standards are established specifically for passenger tires.

Passenger vehicle. For the purposes of this report, a car or light truck used primarily for passenger transportation. Most of these vehicles use passenger tires. Most vans, pickup trucks, and sport utility vehicles that are categorized as light trucks by the federal government are considered passenger vehicles. Light trucks that exceed 6,000 pounds in gross vehicle weight are usually used for non-passenger commercial service. They are usually equipped with light truck (LT) tires.

Performance tire. A passenger tire intended to provide superior handling and higher speed capabilities and generally having a speed symbol of H or V in the United States.

Ply. A sheet of rubber-coated parallel tire cords. Tire body plies are layered.

Radial-ply construction. A pneumatic tire construction under which the ply cords that extend to the beads are laid at approximately 90 degrees to the centerline of the tread.

Two or more plies of reinforced belts are applied, encircling the tire under the tread. Radial-ply tires were introduced in Europe during the 1950s and came into common use in the United States during the 1970s.

Reinforcing filler. Material added to rubber compounds to provide favorable properties, including resistance to abrasion. The two most common reinforcing fillers are carbon black and silica.

Replacement passenger tire. A tire purchased in the aftermarket to replace an original equipment tire.

Rim diameter. The diameter of a wheel measured at the intersection of the bead seat and the flange. The rim diameter is listed in the size designation on the passenger tire sidewall. Common rim diameters for passenger tires range from 13 to 20 inches.

Rolling resistance. The force at the axle in the direction of travel required to make a loaded tire roll.

Run-flat tire. A type of pneumatic tire constructed of special materials, supports, and configurations that allow it to travel for a limited distance and speed after experiencing a loss of most or all inflation pressure. While these tires usually have greater weight and resultant rolling resistance, they permit the elimination of storage space and weight associated with a spare tire and jack.

SAE. Society of Automotive Engineers. SAE technical committees have developed standardized test practices for measuring the rolling resistance of tires.

Section height. The linear distance between an inflated unloaded tire’s overall (outside) tread diameter and the intersection of the bead seat and the flange.

Section width. The linear distance between the outside sidewalls of an inflated unloaded tire (not including decorations such as lettering) when mounted on the measuring rim. Treads are always narrower than the section width.

Sidewall. The portion of the tire between the bead and the tread. The tire’s name, safety codes, and size designation are molded on the sidewall.

Silane. An organo-silicate compound that is sometimes mixed with silica to promote dispersion and bonding.

Silica. A very fine, nano-size particle, silicon dioxide, used as a reinforcing filler in rubber compounding.

Speed rating. A letter assigned to a tire denoting the maximum speed for which the use of the tire is rated (e.g., S = 112 mph, H = 130 mph). The speed rating is contained in the tire size designation molded on the sidewall.

Tire pressure monitoring system (TPMS). A warning system in motor vehicles that indicates to the operator when a tire is significantly underinflated. Some systems use

sensors in the tire to transmit pressure information to a receiver. Some do not have pressure sensors but rely on wheel speed sensors to detect and compare differences in wheel rotational speeds, which can be correlated to differences in tire pressure.

Traction. The ability of a loaded tire to generate vehicle control forces through frictional interaction with a road surface.

Tread. The peripheral portion of the tire designed to contact the road surface. The tread band consists of a pattern of protruding ribs and grooved channels on top of a base. Tread depth is measured on the basis of groove depth. Traction is provided by the tread.

Tread compound. The general term that refers to the chemical formula of the tread material. The compound consists of polymers, reinforcing fillers, and other additives that aid in processing and slow degradations from heat, oxygen, moisture, and ozone.

Tread wear life. Total miles traveled by a tire until its tread wears out, which is usually defined as a remaining groove depth of 2/32 inch for a passenger car tire that exhibits even wear.

Uniform Tire Quality Grade (UTQG). A passenger tire rating system that grades a tire's performance in tread wear durability, traction, and temperature resistance. UTQG ratings are required by the federal government for most types of passenger tires and are molded on the tire's sidewall. The tread wear grade is a numeric rating, with a higher number suggesting longer tread wear capability. Most tires receive grades between 100 and 800. The traction grade is assigned on the basis of results of skid tests on wet pavements. Tires are graded AA, A, B, or C, with AA indicating superior wet traction. The temperature grade is assigned to tires tested at various speeds to determine the ability of a tire to dissipate heat. Tires are graded A, B, or C, with A indicating an ability to dissipate heat at higher speeds.

USDOT. U.S. Department of Transportation. The National Highway Traffic Safety Administration is an agency of USDOT.

USTMA. U. S. Tire Manufacturers Association. USTMA is the national trade association for the tire products industry in the United States. Most domestic and foreign tire makers who produce tires in the United States are members of the association.

Vehicle fuel economy. The average number of miles a vehicle travels per gallon of motor fuel (typically gasoline or diesel fuel).

Viscoelastic. A viscoelastic material is characterized by possessing both viscous and elastic behavior. A purely elastic material is one in which all energy stored in the material during loading is returned when the load is removed. In contrast, a purely viscous material stores no strain energy, and all of the energy required to deform the material is simultaneously converted into heat. Some of the energy stored in a

viscoelastic system is recovered on removal of the load, and the remainder is dissipated as heat. Rubber is a viscoelastic material.

Wear resistance. Resistance of the tread to abrasion from use on a normal road surface.

Wet traction. The ability of a loaded tire to generate vehicle control forces through frictional interaction with a wet road surface

Source: Tires and Passenger Vehicle Fuel Economy: Informing Consumers, Improving Performance, TRB Special Report 286 2006

Coefficient of Variation. The standard deviation divided by the mean.

ISO 28580. A recommended practice of ISO that defines a standardized method for testing tire rolling resistance under controlled laboratory conditions.

ISO 23671. A recommended practice of ISO that defines a standardized method for testing tire wet grip braking performance index relative to a control tire.

Rolling resistance coefficient (RRC). The tested rolling resistance force divided by the test load.

RRC 2.0m. A calculated rolling resistance coefficient (basis of a 2.0m test drum) using the test data generated on a Smithers 1.7m test drum.

Tangent delta. A ratio representing the flexing energy loss due to internal friction and viscous heat generation as a function of total flexing energy input.

Glass transition temperature. The temperature at which molecular mobility begins to take place, below which molecular mobility is frozen and the elastomer becomes rigid and glassy.

Appendix E

Waste Tire Disposal in California

White Paper

Waste Tire Disposal in California







December 13, 2024

Contents

Acronyms 1

Preface 2

Executive Summary 3

Waste Tire Management in California 5

- Issues with Waste Tires 6
  - Illegal Dumping 6
  - Fires 7
  - Vectors 7
  - Other Environmental Issues 8

Waste Tire Stockpile Remediation 8

Waste Tires in California 10

- Background on Waste Tires 11
- Background on All Waste 14

Waste Diversion Goals 16

Why are Waste Tires Landfilled? 18

Overview of Landfills 20

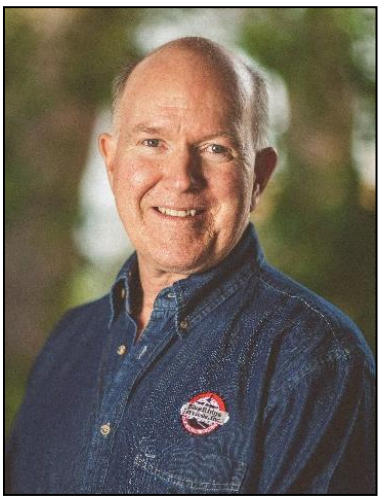
- Waste Management Hierarchy 22
- Landfill Cost Estimates 22
  - Tire Disposal Costs 24

Summary 26

Acronyms

AB	Assembly Bill (i.e., California Legislature)
ADC	Alternative Daily Cover
CalRecycle	California Department of Resources, Recycling, and Recovery
CEC	California Energy Commission
CIWMB	California Integrated Waste Management Board
CRI	Crumb Rubber Infill
CRTMF	California Tire Recycling Management Fund
CSUCRF	California State University, Chico Research Foundation
CTL	Comprehensive Trip Log
CTRA	California Tire Recycling Act
DRS	Disposal Reporting System
DTSC	Department of Toxic Substance Control
EDT	Electronic Data Transfer
EPA	Environmental Protection Agency
FiRM	Financial Resources Management (FiRM) Branch
HDPE	High Density Polyethylene
LCC	Local Conservation Corps
MOLO	Manager of Landfill Operations (SWANA Certification Course)
MOU	Memorandum of Understanding
MSW	Municipal Solid Waste
OEHHA	Office of Environmental Health Hazard Assessment
PCY	Pounds per Cubic Yard
PRC	Public Resources Code
PTE	Passenger Tire Equivalent, defined by CalRecycle (14 CCR § 17225.770)
RAC	Rubberized Asphalt Concrete
RDF	Refuse Derived Fuel
RDRS	Recycling and Disposal Reporting System
SCP	Safer Consumer Products
SWANA	Solid Waste Association of North America
SWIG	Stormwater Infiltration galleries
TDA	Tire-Derived Aggregate
TDF	Tire Derived Fuel
TDPs	Tire-Derived Products
TEA	Tire Enforcement Agency
TIP	Tire Incentive Program
TMAS	Tire Market Analysis and Support
TPD	Tons per day
TPY	Tons per year
TRP	Tire Recycling Program
UCPRC	University of California Pavement Research Center
WTMS	Waste Tire Management System

PREFACE



Neal Bolton is a Registered Civil Engineer with more than 46 years of experience in the heavy construction and solid waste industry. His experience includes many years working as a heavy equipment operator, engineer, supervisor, site manager, and director for various solid waste organizations. He is President of Blue Ridge Services Montana, Inc. (BRS), a company that has provided operational and management consulting support to municipalities and companies within the waste industry since 1988.

Mr. Bolton has written 3 books related to solid waste landfill operations, safety, and operational efficiency. He has also written more than 300 related articles in various online and print trade magazines. He has also taught several hundred courses and seminars to landfill managers, engineers, regulators, owners, operators, and numerous state agencies including Indiana, Kansas, Montana, North Carolina, and the California Integrated Waste Management Board (CIWMB), now known as the California Department of Resources, Recycling, and Recovery (CalRecycle).

In 2021, BRS was hired by the Solid Waste Association of North America (SWANA) to update the new version of their Manager of Landfill Operations (MOLO) course which is the primary certification course for landfill managers throughout much of the U.S. and Canada.

During his career, Mr. Bolton has been onsite at more than 500 landfills across North America and abroad. He and his team have worked on solid waste projects in nearly every U.S. state, Canada, Australia, and other locations around the globe.

He has also been hired more than 70 times as an expert witness around the country on solid waste cases involving injuries, fatalities, financial conflicts, and various permitting and environmental issues.

This report has been prepared based on current regulatory standards, available data, and industry standard practice. Every effort has been made to present various data about waste tire disposal in a way that provides the most knowledgeable and balanced perspective for the reader, specifically regarding how increases in waste tire tonnage could impact California landfills and the environment.

EXECUTIVE SUMMARY

The California Energy Commission (CEC) is evaluating ways to reduce vehicle fuel consumption. One option being considered is to develop rules requiring tire manufacturers to provide vehicle tires with lower rolling resistance, which would translate into improved fuel efficiency.

Rolling Resistance represents one aspect of what the tire industry refers to as the Magic Triangle. The Magic Triangle seeks to improve three separate characteristics of tires by providing:

1. Maximum traction (improves safety)
2. Maximum life (generates less waste)
3. Minimum rolling resistance (reduces fuel consumption)

However, when one aspect of these three things is improved, it can negatively impact others. For example, it appears that by changing tire manufacturing processes, tread patterns, sidewall design, inflation, or other factors, it may be possible to improve rolling resistance, thereby increasing fuel efficiency. But this may result in less traction or reduced tire life. As shown here (See Figure 1), the ideal (green triangle) may become skewed (red triangle), favoring one factor over others.

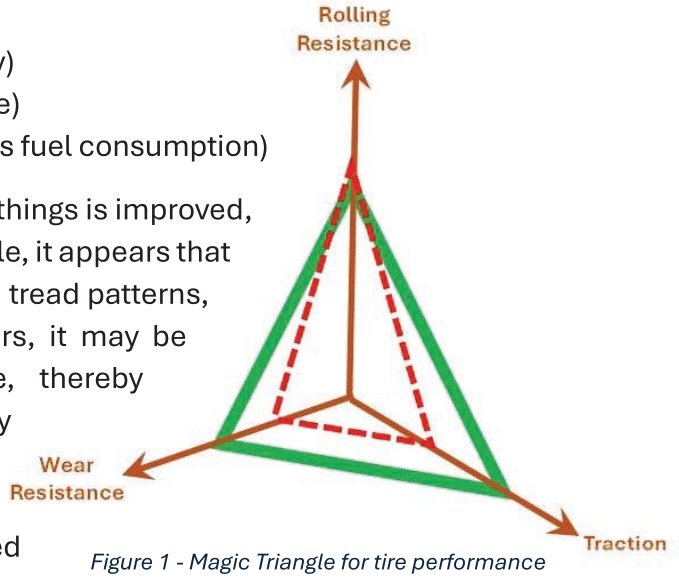


Figure 1 - Magic Triangle for tire performance

Stakeholders must consider the collateral impact of any rule(s) intended to improve tire rolling resistance. Traction (i.e., safety) is one issue, but in the context of this White Paper, any reduction in tire life expectancy would in turn lead to an increase in the number of waste tires generated each year in California.

Concerns related to tire life appear to be exacerbated by an increasing use of electric vehicles (EVs). The increased weight of the average EV and the higher torque produced to the tires can contribute to accelerated tire wear – and reduced tire life. According to a 2022 Forbes article, *"…EVs are modestly **heavier** than the equivalent car. That means you need tires with a higher weight rating, and they will wear out a bit faster."*[1]

That same issue was echoed in CalRecycle's "California Waste Tire Market Report – 2022.[2]

In 2022, California residents and businesses generated more than 600,000 tons of waste tires. This equates to approximately 60 million tires![3] More than half of those tires were buried in landfills.

[1] https://www.forbes.com/sites/bradtempleton/2022/05/02/electric-vehicle-maintenance-is-super-cheap-but-the-dark-secret-is-tires/
[2] California 2022 Tire Market Report – page 22.
[3] Based on Passenger Tire Equivalent (PTE) is defined by CalRecycle (14 CCR § 17225.770) as 20 pounds.

CalRecycle has set an *unofficial* goal to divert (i.e., recycle) 75% of waste tires.[4] This mirrors their mandated statewide goal of diverting 75% of the overall waste stream.[5]

In 2022, waste tire diversion (i.e., recycling) was at 34.7%[6] – far short of CalRecycle's informal 75% recycling target for waste tires. This is due to several converging factors:

1) Many of the alternative uses for waste tires are not easily scalable.

2) End-use markets have not been fully developed.

3) And finally, although the state continues to provide financial incentives to create new technologies and markets for recycling waste tires, many of those alternatives are simply not economically viable, especially when compared to the relatively low cost of landfilling.

In California, waste tires may not be landfilled in a solid waste disposal facility unless they are permanently reduced in volume prior to disposal by shredding, or other methods subject to solid waste Enforcement Agency approval and Department approval.[7]

This tire ban does not apply to waste tires received which are commingled with municipal solid waste that arrive in loads, where the waste tires comprise less than one-half of one (0.5) percent by weight of the total load, or where the waste tires inadvertently arrive in homeowner delivered household loads of mixed waste and are not readily removable from the waste stream.

Yet, even when those processing costs are combined with landfill costs, the total disposal costs are often lower than other options.

Also, unlike some alternative recycling options for waste tires, landfill disposal is easily scalable. The estimated marginal cost (for the landfill) of bringing in 1 additional ton of waste tires to the average California landfill is just over $21 per ton. The amount landfills might charge (i.e., the tipping fee) is estimated to be closer to $69 per ton.[8] This is the average (estimated) landfill tipping fee in California as of 2022. But even at this rate, the cost works out to less than $1 per tire. It's also worth noting that this estimate is based on the listed gate rate. However, if tire disposers have a contract agreement with the landfill, their negotiated cost per ton (and per tire) could be lower.

[4] California 2022 Waste Tire Report, Page ES-ii.
[5] AB341 - https://leginfo.legislature.ca.gov/faces/billNavClient.xhtml?bill_id=201120120AB341
[6] California 2022 Waste Tire Report, Page ES-ii.
[7] 14 CCR § 17355 - Disposal of Waste Tires at Solid Waste Disposal Facilities.
[8] Using $1.70 increase per year from $54 per ton (2013) to $69 per ton (2022). Source: Landfill Tipping Fees in California (pages 35-36) – 2015 Report by CalRecycle.

The overall cost for landfilling tires, including segregating, processing, and transportation (See Figure 2) is relatively low compared with other tire recycling options. Consequently, in a cost-driven market, landfill disposal of waste tires is likely to continue, at least until other viable and cost-effective alternatives become available.



Figure 2 - Tires stored onsite prior to being transported to shredder.

This White Paper considers possible impacts on the state's solid waste industry – primarily on landfills – if more waste tires are generated because of regulations to improve rolling resistance. By examining the past, present, and potential future impacts of waste tire disposal on the solid waste industry in California, this paper will provide the reader with a perspective regarding those impacts – and additional knowledge that will help various stakeholders and decision-makers.

WASTE TIRE MANAGEMENT IN CALIFORNIA

In 1989, the California Tire Recycling Act (CTRA) created the Tire Recycling Program (TRP). Funding for the TRP was provided by the California Tire Recycling Management Fund (CTRMF). Initially a fee of $1.75 per tire was scheduled to be reduced to $0.75 per tire on January 1, 2024. But Assembly Bill 2836 extended the $1.75 per tire California Tire Fee (fee) until January 1, 2034.

Since 2005, the fee has been $1.75 with $1.00 going to CalRecycle and the remaining $0.75 going to the California Air Resources Board. The $1.00 CalRecycle portion of the fee is used to fund activities in the Five-Year Tire Plan that include the permitting and enforcement of waste tire facilities, cleanup of waste tires at illegal waste tire facilities, and activities to promote waste tire recycling and market development."[9]

[9] Five-Year Plan for the Waste Tire Recycling Management Program, July 1, 2023 – Page 6.

Rigorous waste tire enforcement, pursuant to CalRecycle's policy goals, minimizes the likelihood that large waste tire sites will develop, go unaddressed, and potentially cause environmental catastrophes like the Westley tire fire and Tracy tire fires that occurred in the late 1990s. Large waste tire fires can be a serious environmental issue (See Figure 3).



Figure 3 - Illegal dumping and stockpiling of tires poses fire risk.

ISSUES WITH WASTE TIRES

ILLEGAL DUMPING

Waste tires, if not properly disposed, pose many risks to people and the environment. One of the root issues is illegal dumping of waste tires (See Figure 4). Most people have seen discarded tires in vacant lots, along country roads, and in other hidden locations. But while illegal dumping of waste tires on this scale is unsightly, it is the unregulated dumping of large quantities of tires that poses a much higher risk of disease vectors, and perhaps most importantly, fires (See Figure 3 and Figure 5).



Figure 4 - Excerpt from, "Illegal Dumping Prevention Guidebook" - EPA

According to the EPA's Illegal Dumping Prevention Guidebook, "Illegal dumping is a problem in many areas because of a lack of effective legal codes or ordinances prohibiting open dumping or burning of wastes. Both activities are prohibited by federal and most state laws, but enforcement by local authorities is typically done under local codes, which may be less stringent."[10] California has rules that are, for the most part, effectively addressing the waste tire issue, specifically as it relates to large stockpiles of tires.

Fires

For many years, California struggled to deal with unscrupulous operators who were paid to receive waste tires, while operating without appropriate permits. Some of these unpermitted operations received millions of tires over the course of many years, with the owners/operators pocketing the money and doing little except providing a piece of land on which to dump waste tires.



Figure 5 - Large tire fires burn for a long time and cost millions to remediate.

Two of those previously obscure operations achieved front-page notoriety in the late 1990s when both of those massive tire stockpiles caught fire. The Tracy Fire[11] started on August 7, 1998, and burned for 2 years. The Westley Tire Fire[12] started approximately 13 months later, on September 22, 1999.

Both fires were in California's San Joaquin Valley, and both were considered major environmental disasters. Suppression and cleanup costs ran into millions of dollars.

Vectors

Piles of waste tires can provide habitat for a wide range of pests and insects. Rainwater pooled in stored tires provides habitat for mosquitoes carrying various diseases that can impact humans.

Poorly managed tire piles may also provide shelter for rats, mice, skunks, and other pests that may pose disease risk to humans.

[10] EPA's Illegal Dumping Prevention Guidebook.
[11] Tracy Tire Fire Fact Sheet.
https://dtsc.ca.gov/wp-content/uploads/sites/31/2017/11/TracyTireFire_FS_DRAP_0703.pdf
[12] Westley Tire Fire – EPA Archived Document.
https://archive.epa.gov/emergencies/content/fss/web/pdf/tirefire.pdf

Other Environmental Issues

In normal landfill conditions, disposal of processed tires poses no measurable risk to human health or the environment due to leaching, outgassing, or biodegradation.

However, particulate emissions from the normal wear of tires along roadways may pose some respiratory risk to humans in the form of $PM_{2.5}$ and PM_{10}. So, while this does not necessarily affect waste disposal, it could be exacerbated if changes to tire design result in tires that are less durable. Faster wear equals increased potential for particulate release. The California Air Resources Board (CARB) refers to this as non-exhaust particulate matter emissions.[13]

Additionally, a 2023 study conducted by the Washington State Department of Ecology,[14] found that 6PPD-q, a transformation product of a chemical preservative used in tires to increase tire lifespan, can cause Coho Salmon mortality, when tire particulates are washed from roadways via stormwater runoff into habitat waterways. Again, this has little to do with tire disposal but could be an issue when it comes to improving tire rolling resistance while maintaining tire lifespan. As with airborne particulate matter, faster tire wear could potentially lead to increased levels of 6PPD-q.

Waste Tire Stockpile Remediation

Having previously recognized the problems associated with waste tire piles, and immediately following the massive Tracy and Westley tire fires that occurred in 1998 and 1999, respectively, CalRecycle put considerable money and effort into remediating piles of waste tires.[15] This effort was still ongoing in 2022. That remediation effort peaked in 2002 when more than 214,000 tons of waste tires were remediated, followed by removal of nearly 149,000 tons in 2004 (See Figure 6).

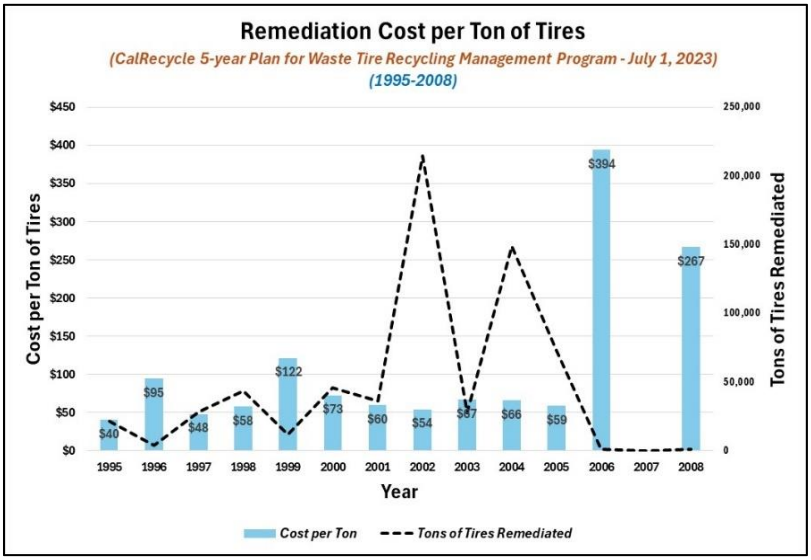


Figure 6 - CalRecycle 5-Year Plan for Waste Tire Recycling Management Program 1Jul2023

[13] CARB – Information on non-exhaust particulate emissions. https://ww2.arb.ca.gov/resources/documents/brake-tire-wear-emissions

[14] 6PPD-q Impacts on Coho Salmon. *https://ecology.wa.gov/waste-toxics/reducing-toxic-chemicals/addressing-priority-toxic-chemicals/6ppd*

[15] CalRecycle 5-Year Plan for Waste Tire Recycling Management Program.

Those two years of effort alone remediated an estimated 363,000 tons of waste tires, equivalent to approximately 363 million[16] tires. This commendable effort greatly reduced the risk of future tire fires in California.

Because of the volume of tires remediated during those peak years, the cost per ton for remediation was relatively low. This can be seen in this chart (See Figure 7).

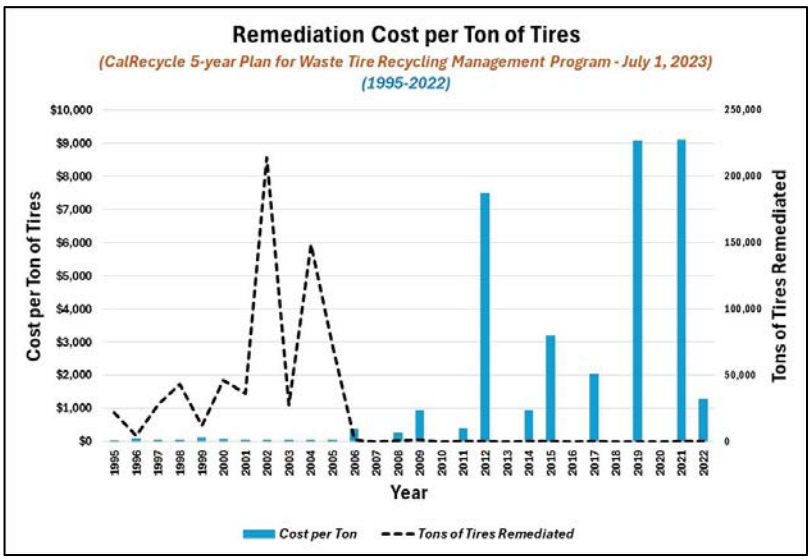


Figure 7 - CalRecycle 5-Year Plan for Waste Tire Recycling Management Program 1Jul2023

However, starting in 2006, the cost for remediating waste tires increased dramatically from an average of just over $60/ton (1995-2005) to $394 per ton.

As shown here (See Figure 7), by 2019 and 2021, the remediation costs had increased to more than $9,000 per ton. This appears to be a result of the declining economy of scale, where during those two years, waste tire remediation amounted to only 3 tons and 10 tons, respectively. All stakeholders should be aware that tire stockpile remediation costs may far exceed the cost of landfilling waste tires, or just about any other waste tire option.

From 1995 to 2005, remediation of massive amounts of waste tires made environmental and economic sense. But by 2006, the number of illegally disposed tires had decreased dramatically – to the point where the "per ton" remediation costs were excessive.

At this time, fewer than 25,000 waste tires are estimated to remain in stockpiles throughout California.[17] Compared to historic conditions, these smaller numbers represent less threat to public health, safety, and the environment. Currently, it appears that CalRecycle's focus has changed to managing waste tires through other programs aimed at developing alternatives to landfill disposal of waste tires.

Currently, these alternative programs are unable to compete effectively against landfill disposal options. Based on the increasing number of tires going to landfills, it appears more work will be required to develop those disposal alternatives.

The next sections of this White Paper examine some of the trends related to waste tires, and some of the key factors that have pushed more waste tires toward landfill disposal.

[16] Based on Passenger Tire Equivalent (PTE) is defined by CalRecycle (14 CCR § 17225.770) as 20 pounds.
[17] https://calrecycle.ca.gov/Tires/

WASTE TIRES IN CALIFORNIA

CalRecycle tracks various data related to waste tires (See **Error! Reference source not found.**). This table provides detailed information regarding waste tires in California from 2009 to 2022.[18] It includes information regarding how many tons of waste tires were generated during those years, along with a breakdown of recycling vs landfill disposal.

Category	Year													
	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
Total Tons Waste Tires	412,117	411,842	408,460	450,371	420,177	441,907	442,319	455,168	488,149	511,262	518,353	479,017	551,921	601,024
Tires Landfilled	131,152	92,033	63,444	47,908	61,682	66,770	87,170	150,226	117,448	95,401	95,412	154,050	249,377	298,084
Disposal Related	114,968	155,603	177,500	222,695	207,754	217,043	202,382	159,654	213,707	241,597	240,503	149,099	109,347	94,163
Recycled	165,997	164,206	167,516	179,768	150,741	158,094	152,767	145,288	156,994	174,264	182,438	175,868	193,197	208,777
% Recycled	40.3%	39.9%	41.0%	39.9%	35.9%	35.8%	34.5%	31.9%	32.2%	34.1%	35.2%	36.7%	35.0%	34.7%
% Diverted from Landfill	68.2%	77.7%	84.5%	89.4%	85.3%	84.9%	80.3%	67.0%	75.9%	81.3%	81.6%	67.8%	54.8%	50.4%
% Landfilled	31.8%	22.3%	15.5%	10.6%	14.7%	15.1%	19.7%	33.0%	24.1%	18.7%	18.4%	32.2%	45.2%	49.6%

Figure 8 - CalRecycle Waste Tire Market Report 2022, published May 15, 2024 – Table C-2

- **Total Tons Waste Tire.** *Represents the total tons of waste tires generated in California.*
- **Tires Landfilled.** *Landfill Disposal is the tonnage of end-of-life tires going directly to the landfill as waste material.*
- **Disposal Related.** *Tire Derived Fuel, Baled Tires and Treads, and Landfill Alternative Daily Cover are combined and referred to as sub-total Disposal Related.*
- **Recycled.** *The Retread, Used Tire, Crumb/Ground Rubber, Tire Derived Aggregate, and Other Recycling categories are combined and referred to as the subtotal Recycled.*

From 2009 to 2022, waste tire generation, statewide, averaged nearly 471,000 tons per year. But more importantly, the quantity of waste tires generated in California grew at an overall average of approximately 3% per year from 412,117 tons in 2009, to 601,024 tons in 2022 (See **Error! Reference source not found.**). This upward trend is likely to continue,[19] for several reasons, as stated in CalRecycle's 2022 California Waste Tire Market Report (page 27):

> *"With added waste tire volume from the expansion of electric vehicles (EVs) and production of new larger original equipment manufacturer (OEM) tires, the waste tire industry expects to see future increases in waste tire generation. Heavier vehicles, which include EVs, use tires up to 30% faster and the annual sales of EVs are projected to increase by 50% by the end of 2023. This, along with the trend of new OEM tires being larger and therefore comprised of more rubber material, is contributing to an increase in the yearly waste tire tonnage of California and the nation."*

[18] CalRecycle Waste Tire Market Report 2022, published May 15, 2024 – Table C-2
[19] CalRecycle's 2022 California Waste Tire Market Report, page 27.

Using CalRecycle's standard 20 pounds per tire estimate, the 601,024 tons of waste tires generated in 2022 equates to something more than 60 million tires. The actual number of tires is likely somewhat lower because the average tire weighs more than 20 pounds. None-the-less, this is currently the standard conversion factor used by CalRecycle.[20]

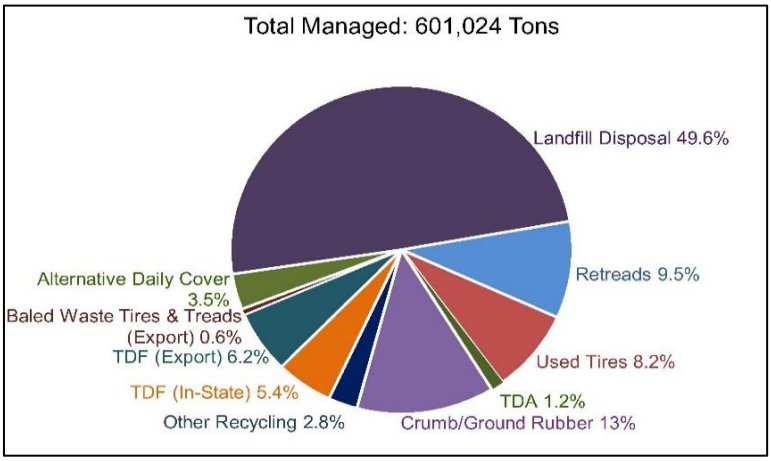


Figure 9 - From California Waste Tire Market Report: 2022

Of those 601,024 tons of waste tires disposed in 2022, nearly half (49.6%) were disposed in landfills (See Figure 9). Further, when we also add the 3.5%[21] of chipped tires that were utilized as Alternative Daily Cover (ADC) in lieu of soil to cover landfill trash each day, we see that more than half (53.1%) of the waste tires generated in California in 2022 ended up in a landfill.

In 2022, an estimated 319,253 tons of waste tires went into California landfills (See Below).

- Tons of tires landfilled: 298,084 tons (See Figure 10)
- Tons of tires used for ADC: 21,169 tons
- Total tons of waste tires landfilled, including ADC: 319,253 tons

BACKGROUND ON WASTE TIRES

Historically, there were few options for disposing of tires, except for landfilling whole, (intact) tires. Because of the high volume to weight ratio, those whole tires consumed a higher relative volume of landfill airspace (i.e., capacity) compared to most other waste materials.

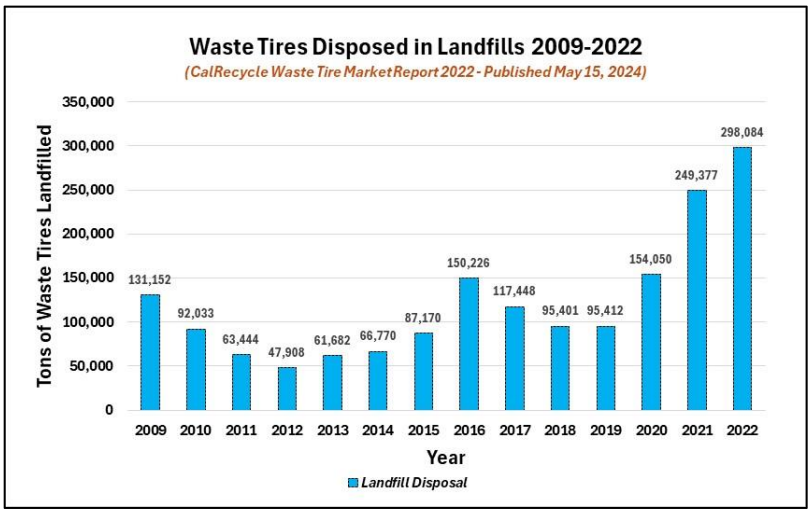


Figure 10 - Source Data for Chart: California Waste Tire Market Report: 2022 (Table C-15).

In response, some landfills increased the per ton disposal fee for tires. However, because landfilling whole tires consumed an excessive quantity of landfill airspace, some landfills opted to stockpile tires on

[20] Passenger Tire Equivalent (PTE) is defined by CalRecycle (14 CCR § 17225.770) as 20 pounds.
[21] California Waste Tire Market Report: 2022, Figure 1

site, hoping that at some point, a viable and economical alternative to landfilling tires would become available.

In other cases, some landfill owners entered into risky agreements with unscrupulous businesses that promised a viable end-use for waste tires, *"…once the landfill had stockpiled enough tires to make their system economically viable."* In many cases, the *"business"* retained the tire fee but went bankrupt before delivering the promised *"solution."*

Along a similar, but less ethical line, some landowners were accepting tires at discounted rates, stockpiling literally millions of tires, with no viable disposal solution. Others may have hoped that some technology would one day turn those tires into a valuable commodity. No such solution has yet been developed. Those individuals and/or businesses that accepted and stockpiled waste tires often operated outside of compliance with regulatory and permit requirements.

There is no easy solution for disposing of the 60 million or so tons of waste tires generated in California every year. Disposal options will likely continue following the market, which for the foreseeable future leads predominantly to landfill disposal. Some landfills also use processed waste tires in lieu of soil to cover trash at the end of each day (See Figure 11). This is referred to as Alternative Daily Cover, or ADC. More detailed information on ADC will be presented later. This is the current reality despite CalRecycle's alternative recycling goals.

On July 1, 2023, CalRecycle published their most recent waste tire report to the Legislature – the "***Five-Year Plan for the Waste Tire Recycling Management Program***."[22] A similar 5-year plan has been published every 2 years since 2001. The requirement to prepare and submit these 5-year plans was set forth in 2000 through SB 876.

Among other things, this plan re-states CalRecycle's waste hierarchy[23] – which applies to waste tires. That hierarchy is:

1. Source Reduction
2. Recycling
3. Transformation (energy recovery, tire-derived fuel TDF))
4. Disposal

[22] Link to Download Plan - https://www2.calrecycle.ca.gov/Publications/Details/1723
[23] https://www2.calrecycle.ca.gov/Publications/Details/1723, page 1

However, even though "disposal" is the least-preferred option, in 2021, approximately 45% of the total 551,900 tons of waste tires generated in California went to landfills. Another 3% that were used as Alternative Daily Cover (ADC) also ended up in landfills. With some annual variation, the use of processed waste tires for ADC has steadily increased (See Figure 11). Overall, nearly half (48%) of all waste tires generated in California in 2021 were landfilled.

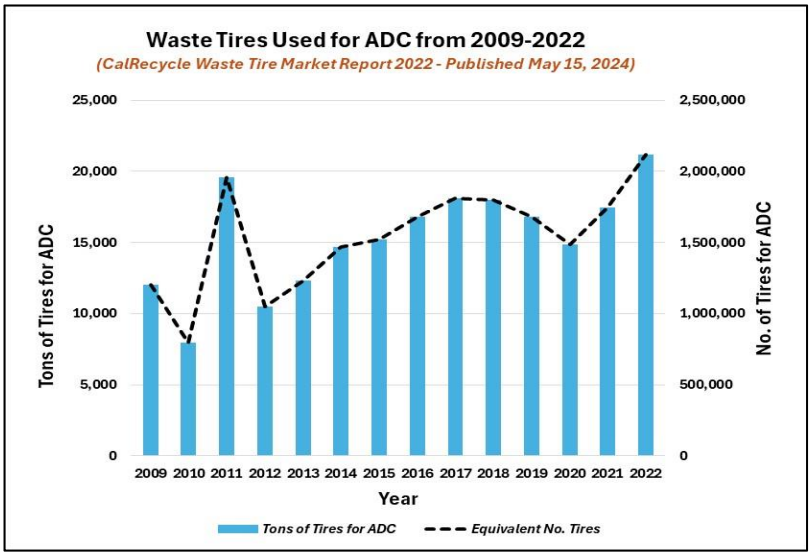


Figure 11 - Source Date for Chart: California Waste Tire Market Report: 2022 (Table C-3)

In 2022, the percentage of waste tires going into landfills increased to 53.1%, including direct disposal and ADC. This appears to show the increasing discrepancy between CalRecycle's hierarchy goals and the reality of the waste tire market.

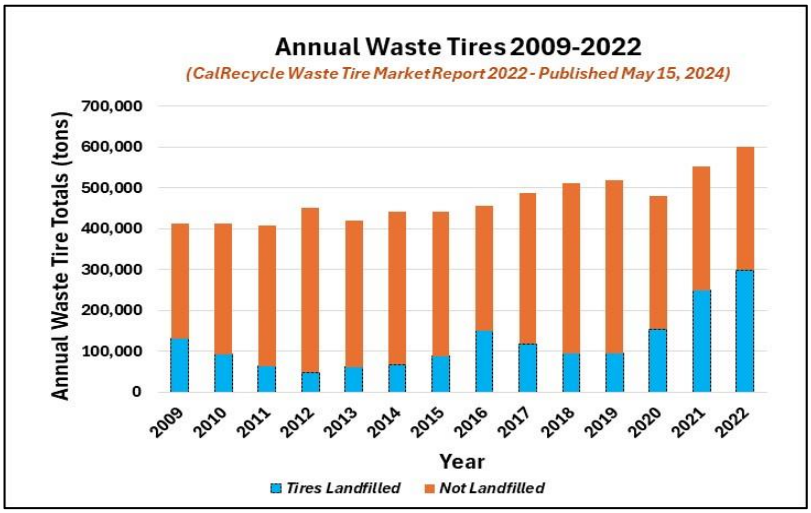


Figure 12 - Annual tonnage of waste tires generated in California.

Root causes for the high rate of landfill disposal can be attributed predominately to cost. For tires, as for many other types of waste, the landfill option is the most economical. It is also a simple and easy solution, because landfills are widely distributed and provide a relatively close and convenient disposal destination.

The quantity of waste tires landfilled in California from 2009 to 2022 varied widely as shown in this chart of actual tonnage (See Figure 12).

That wide variation ranges from less than 20% of all waste tires in 2012 to nearly 50% in 2022 (See Figure 13). This has been attributed to several factors,[24] including:

- Disrupted export economics
- Logistical feasibility

[24] CalRecycle's "California Waste Tire Market Report: 2022, page 21."

- Bans of imported TDM from previously accepting countries (affecting exporting companies)

According to the 2022 California Waste Tire Market Report, *"...The activities described in this Plan are intended to increase the tire recycling rate through a combination of additional research to address barriers to increasing markets for waste tire products and technologies, increased marketing, and outreach/education, increasing the amount of waste tire material used in products, continuing to provide incentives/grants, and increasing waste tire processing capacity. Of course this is also accompanied by ongoing financial support, mostly in the form of grants."*

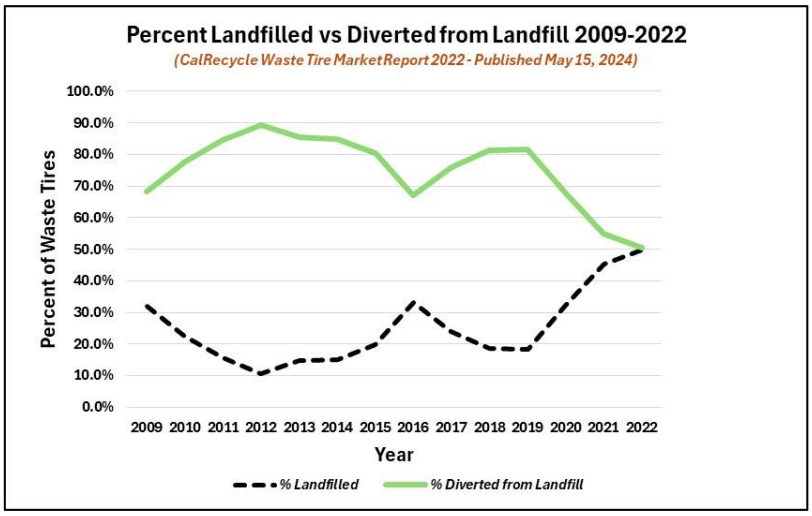


Figure 13 - Waste tires diverted and landfilled 2009-2022.

BACKGROUND ON ALL WASTE

To provide a broader perspective of how waste tires fit into California's overall waste stream, consider that in 2022, California landfills disposed a total of 38,735,966 tons of waste and applied an additional 2,546,015 tons of ADC (See Figure 14).[25]

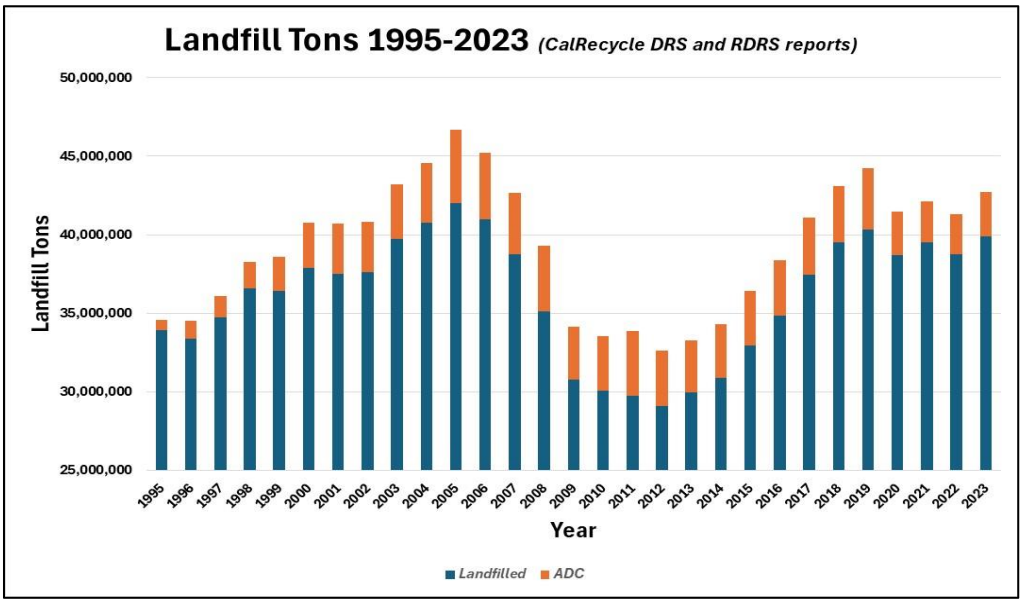


Figure 14 - Source: https://www2.calrecycle.ca.gov/LGCentral/DisposalReporting/Statewide/Disposal and https://www2.calrecycle.ca.gov/RecyclingDisposalReporting/Reports/StatewideTotalDisposalMaterials

[25] https://www2.calrecycle.ca.gov/RecyclingDisposalReporting/Reports/StatewideTotalDisposalMaterials

By comparison, in 2022, waste tires represented only 0.77% of the total waste tonnage landfilled. Similarly, that same year, waste tires used as ADC represented 0.83% of the total Alternative Daily Cover (ADC) material used at landfills. All this waste tire material was ultimately buried in landfills.

Overall, the waste tires that were landfilled in 2022 represented less than 1% of the total solid waste material placed in California landfills that year. On a percentage basis, one might assume that waste tires are somewhat insignificant – representing after all, less than 1% of California's overall waste stream.

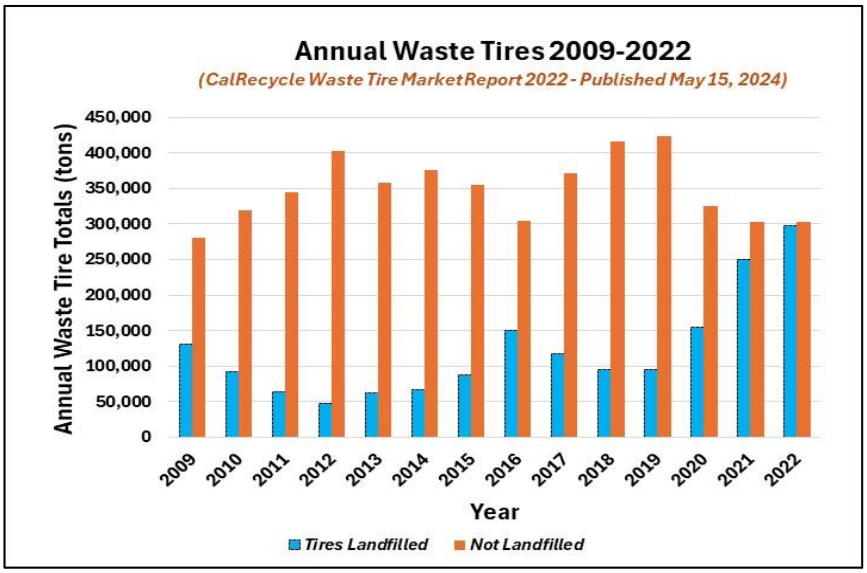


Figure 15 - Annual Waste Tire Totals - Landfilled vs not landfilled.

However, based on the sheer volume of that overall waste stream, we've estimated that waste tires landfilled (298,084 tons) and used as ADC (21,169 tons), consumed approximately 532,000 cubic yards of California's landfill airspace (See Below). What's more, the tonnage of waste tires landfilled vs not landfilled has increased dramatically in recent years (See Figure 15).

$$(\mathbf{298,084}\ \boldsymbol{tons} + \mathbf{21,169}\ \boldsymbol{tons}) \times \frac{\mathbf{2,000}\ \boldsymbol{lbs}}{\mathbf{1}\ \boldsymbol{ton}} \times \frac{\mathbf{1}\ \boldsymbol{cubic\ yards}}{\mathbf{1,200}\ \boldsymbol{lbs}} = \mathbf{532,088}\ \boldsymbol{cubic\ yards}$$

This equates to the volume of landfill airspace that could service the annual landfill disposal capacity needs for the more than 300,000 California residents – or for example; every resident in the City of Riverside.

Waste tires represent less than 1% of landfilled waste in California, but this is not an insignificant amount. Further, the total 319,253 tons of waste tires (298,084 +21,169), at an estimated (internal landfill only) cost of $21.26 per ton, comes at a cost of more than $5.2 million for the disposal cost alone. Please note this is the landfill operations and capital cost, and does not include actual tipping fee, tire processing, or transportation costs.

Based on the landfill's gate rate that was estimated to be approximately $69 per ton, the disposal cost alone could exceed $22 million. This cost is borne by the waste tire disposer and ultimately by individual consumers.

The basis for this cost is explained later in this report.

The upward trend in landfill disposal of waste tires contrasts with CalRecycle's diversion goals for the solid waste industry, despite the many steps that have been taken to discourage disposal of waste tires in landfills.

WASTE DIVERSION GOALS

California has established a mandate to divert 75% of its overall waste stream.[26] Waste diversion in California currently sits at 41%.[27]

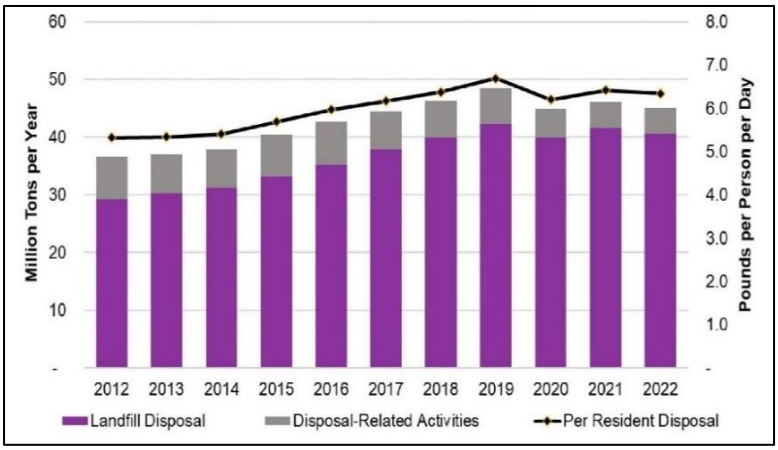


Figure 16 - Landfill Disposal Tons per CalRecycle's "2022 State of Disposal and Recycling Report"

In calendar year 2022, California's 38.9 million residents and 1.7 million businesses generated an estimated 76 million tons of waste material.[28] Of that waste, 59% (45.1 million tons) went to a disposal-related destination, including 40.5 million tons that were buried as waste at landfills (See Figure 16). The remaining 41% (31 million tons) were recycled.

Like waste tires, the diversion of California's overall waste stream is currently below historical levels. This is partly because much of the low-hanging fruit, predominantly recycling, has already been taken and now, getting the rest of the way to 75% will require much additional effort. So, while the 75% recycling goal still stands as a California mandate, the numbers indicate there is still far to go. This shortfall is also due to a clearer understanding by consumers and businesses that recycling often costs more than disposal. We are seeing the free market in action.



Figure 17 - Recycling Rates for All Materials and Waste Tires. California Waste Tire Market Report: 2022

CalRecycle also has an *unofficial* goal to divert 75% of waste tires generated within the state. Currently the recycling rate for waste tires comes in at approximately 34.7% (See Figure 17).[29]

[26] AB 341
[27] CalRecycle's "2022 State of Disposal and Recycling Report," page 14.
[28] CalRecycle's "2022 State of Disposal and Recycling Report," page 3.
[29] California Waste Tire Market Report - 2022

CalRecycle has an unmandated goal of reaching 75% diversion of waste tires generated in California. That goal includes the following components:

- Increasing the tire recycling rate through a combination of additional research to address barriers to increasing markets for waste tire products and technologies, increased marketing, and outreach/education, increasing the amount of waste tire material used in products, continuing to provide incentives/grants, and increasing waste tire processing capacity.
- Developing long-term, sustainable, and diversified market demand for tire-derived products made in California.
- Ensuring the protection of public health, safety, and the environment while developing a safe and high-quality supply infrastructure to meet that demand.
- Fostering information flow, technology, and product development so environmental protection and diversion goals are achieved with supply and demand in balance.[30]

At this point, the unofficial 75% recycling goal for waste tires faces many challenges, even as landfilling of waste tires increases (See Figure 18). Increasing the tire recycling rate from less than 35 percent to 75 percent is an uphill climb that will require a combination of the following activities:

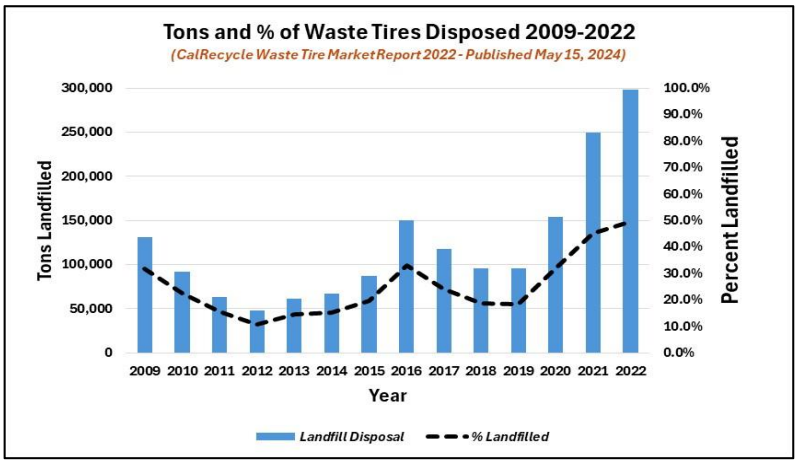


Figure 18 - Tons and percent of waste tires landfilled 2009-2022.

- Applying the results of research to identify new waste tire uses and address existing barriers to increasing markets for waste tire products and encouraging the use of technologies.
- Evaluating, assessing, and promoting emerging technologies that could result in additional tire recycling markets.
- Continuing efforts to increase marketing and outreach/education about tire derived products.
- Increasing the amount of tire material used in tire-derived products and expansion of new uses in civil engineering applications.
- Continuing to provide incentives, grants, and loans to expand markets and increase waste tire processing capacity to support new recycling markets.[31]

[30] Five-Year Plan for the Waste Tire Recycling Management Program – July 1, 2023, Page 1.
[31] Five-Year Plan for the Waste Tire Recycling Management Program – July 1, 2023

The last bullet provides insight into perhaps the biggest hurdle CalRecycle faces in its effort to increase waste tire recycling: the relatively low cost of landfill disposal.

This leads to a more fundamental discussion about the economic factors that drive how waste tires are disposed or recycled.

WHY ARE WASTE TIRES LANDFILLED?

In their 2023 Five-Year Plan for the Waste Tire Recycling Management Program, CalRecycle lists several options for recycling waste tires including:

1. Tire Derived Aggregate (TDA)
2. Rubberized Asphalt Concrete (RAC)
3. Tire-Derived Products

Waste tires are ending up in California's landfills because of market factors of convenience, capacity, and perhaps most importantly, cost.

In general, when the market is allowed to find its own equilibrium, there is a direct relationship between the cost of landfilling and the amount of recycling that occurs (See Figure 19). Outside of any other incentives, rules, or pressures, recycling increases directly in relation to the increasing cost of landfilling.

From this perspective, low landfill costs will typically result in less recycling, and vice versa.

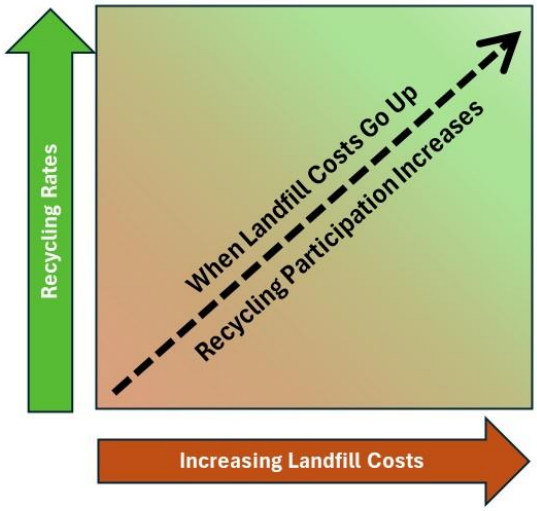


Figure 19 - Relationship between landfill costs and recycling.

Interestingly, one would expect that increasing regulatory demands on landfills would tend to increase landfill costs, and this has happened, to a point.

But it has also reduced the number of landfills, which means the remaining landfills are, on average, larger (i.e., more tons per day).

Larger landfills have a greater economy of scale, greater competition between them, and generally, a lower cost per ton.

Compared to other options for waste tires, landfilling is a relatively simple and inexpensive option, even when the cost of processing and transportation are included.

This is recognized not only in California, but throughout the U.S. This chart based on 2015 data shows the direct relationship between landfill tipping fees and the percentage of municipal solid waste (MSW) recycled in all 50 states (See Figure 20). Clearly, as landfill prices increase, less waste comes to landfills – and more is recycled. The red dot shows California's position at an estimated $69 per ton as of 2022.

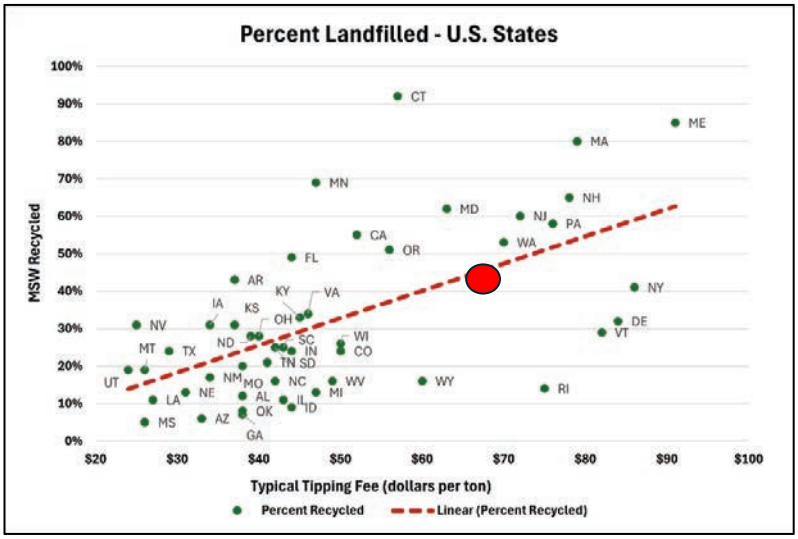


Figure 20 - Typical fees v percent landfill in 50 U.S. States. from "Landfill Tipping Fees in California (2015)," pages 50-51.

The same direct relationship between landfill costs and recycling is clear in the European Union (EU) as well (See Figure 21). Again, the red dot compares California's relative status at $69 per ton as of 2022.

This information is interesting, and informative, but it cannot necessarily be taken as the model for conditions in California, because every U.S. state and every E.U. country has its own demographics, culture, economy, and goals for managing MSW.

However, by understanding how landfills work, we can offer more clarity on the factors impacting the disposal of waste tires.

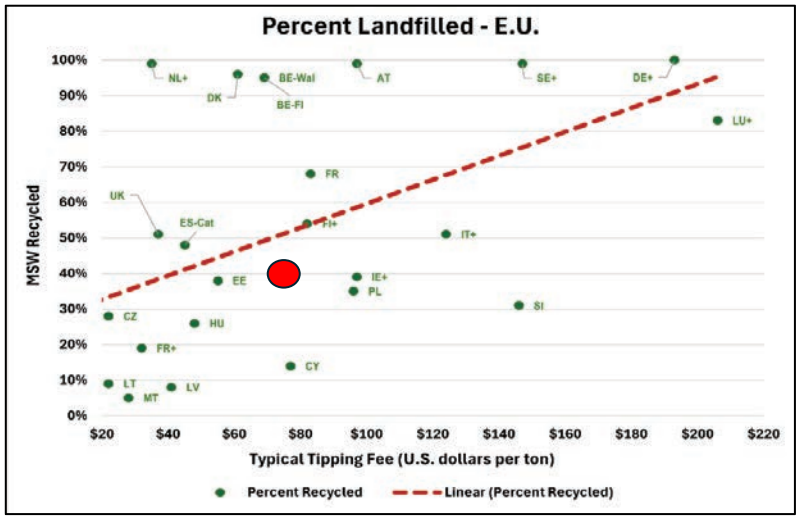


Figure 21 - Typical fees v percent landfilled in EU member state. from "Landfill Tipping Fees in California (2015)," page 52.

OVERVIEW OF LANDFILLS

There are many types of landfills, but in the context of this report, the term "landfill" refers to a facility that receives non-hazardous MSW. Currently, there are approximately 130 active MSW landfills in California.[32]

For the past 60 years, landfills have gradually become more sophisticated in terms of design, operational practices, and environmental integrity. In 1993, the US EPA's Subtitle D rules established sweeping changes for MSW landfills. Those rules required, among other things, that all landfills must have base-grade liners, leachate collection systems, groundwater monitoring, strict operating practices, specific end-of-life closure requirements, and must provide a minimum of 30-years post-closure monitoring and site maintenance.

To avoid the very high cost associated with these regulations, many local landfills closed and were replaced with transfer stations. Waste was then transported from a broad network of local transfer stations to a smaller group of large, regional landfills. Nationwide, the number of landfills decreased from more than 8,000 to approximately 2,000 because of Subtitle D. Similar reductions were seen in California.

The implementation of these regulations caused a major shift in how landfills were sited, designed, and operated. This resulted in a major increase not only in the cost of landfilling, but in the value placed on landfill airspace (i.e., fillable capacity). Landfill airspace is a very valuable commodity. In fact, the Securities and Exchange Commission (SEC) specifically recognizes landfill airspace as an asset.

All states, including California, adopted their own rules that met or exceeded Subtitle D. In California, MSW landfills are regulated under Title 14 and Title 27. CalRecycle is the primary regulator of landfills in California, but many other agencies also provide regulatory oversight.

One of the most important operational requirements under these rules is that every MSW landfill must cover all exposed waste with a minimum of 6 inches of soil at the end of every operating day (See Figure 22).

The rules also allow for an Alternative Daily Cover (ADC) to be used in lieu of soil.



Figure 22 - Bulldozer placing cover soil on exposed waste.

[32] Source: CalRecycle SWIS List

There are many manufactured ADC products including tarps (See Figure 23), plastic film, spray-on foam (See Figure 24), and other materials that can cover the waste while consuming less landfill airspace than soil.



Figure 23 - Bulldozer placing ADC (tarp) on exposed waste.

Many landfills elect to use waste materials, including chipped or shredded tires, as ADC, in lieu of soil. This also reduces airspace consumption because those materials would otherwise go into the landfill as waste. By using waste-derived ADC materials, landfills can reduce the quantity of soil required, thereby saving airspace and money.



Figure 24 - Spray-on Foam ADC.

CalRecycle allows, under certain conditions, that landfills may stockpile shredded tires (See Figure 25) for use as ADC.



Figure 25 - Chipped tires at landfill.

There are eleven types of ADC described in California regulations. This list of materials, which includes shredded tires, is essentially pre-approved for use as ADC at California landfills.[33]

Additionally, those rules go on to state that,

- *"Shredded tires cannot be applied when a 40 percent chance of precipitation is forecast within 8 hours of application.*
- *50 percent by volume is smaller than 6 inches in length and*
- *no individual pieces are greater than 12 inches in length."*[34]

[33] (Title 27 CCR 20690 (b) (1-11))

[34] Alternative Daily Cover White Paper by CalRecycle (formerly California Integrated Waste Management Board) October 2009

Because of the tremendous value of landfill airspace, most landfills are aggressive when it comes to using various types of ADC (See Figure 26, Figure 27, and Figure 28).



Figure 26 - Disposable film applied as ADC.



Figure 27 - Spray-on cement-based ADC.



Figure 28 - Shredded Tires - EPA image.

WASTE MANAGEMENT HIERARCHY

In the normal waste management hierarchy, landfills are at the bottom of the heap so to speak, ranking below all other waste management options, including source reduction, recycling, and energy recovery (See Figure 29).[35] Landfills are society's last choice for waste management. Only when there are no other options should material go to a landfill.

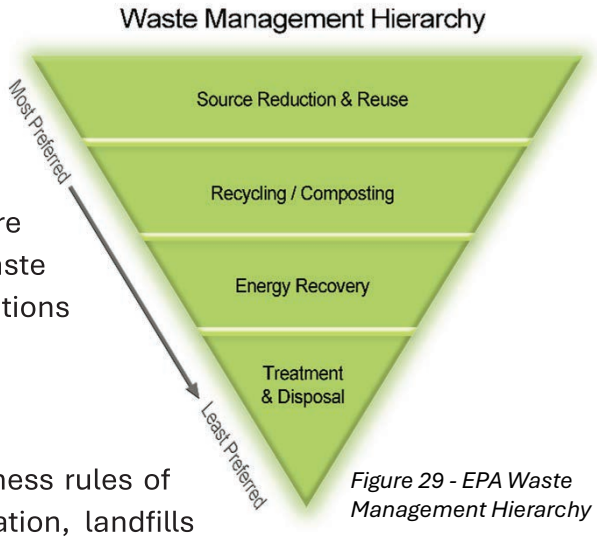


Figure 29 - EPA Waste Management Hierarchy

LANDFILL COST ESTIMATES

Landfills are also subject to the universal business rules of cost vs benefit. On the cost side of the equation, landfills typically invest millions of dollars and many years on permitting, design, and construction before reaching the point where they can receive waste.

[35] https://www.epa.gov/facts-and-figures-about-materials-waste-and-recycling/national-overview-facts-and-figures-materials#:~:text=The%20total%20generation%20of%20municipal%20solid%20waste%20%28MSW%29,specified%29%20or%204.9%20pounds%20per%20person%20per%20day

Subsequently, there are many years of operation where landfills must generate enough revenue to cover the cost of that development, operational costs, and future expenditures for closure and post-closure.

There is an economy of scale based on the quantity of waste a landfill receives. A small landfill may have a much higher incremental (i.e., marginal) cost of receiving additional waste than a large landfill. This relationship is shown here (See Figure 30).

Please note that this cost data reflects a landfill's internal capital and operating costs rather than the market-driven tipping fee.

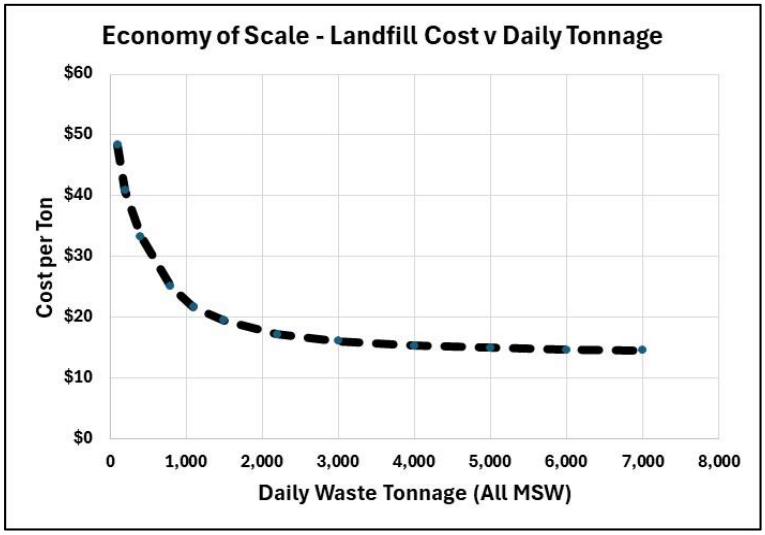


Figure 30 - Estimated Operating Cost, based on BRS Industry Experience.

In February 2015, CalRecycle published a report on *Landfill Tipping Fees in California*.[36] This report provided an in-depth review of what landfills charge for waste disposal. Landfill costs vary widely (See Figure 31).

In this report, CalRecycle refers to two categories of tipping fees, the listed "gate rate" that most self-haul customers pay, and the "negotiated rate" that many commercial customers pay. Self-haul customers dispose of about 20 percent of the overall landfill waste stream, while commercial customers, who often work under a negotiated rate, bring in approximately 80 percent of the waste stream.

This CalRecycle report found that the average tipping fee for MSW disposal at landfills (in California) was $54 per ton (in 2013), and the annual increase from previous years was estimated to be $1.70 per ton from.

Range (Per Ton)	Number of Landfills	Percentage of Landfills
$0-$35	12	12%
$36-$50	45	46%
$51-$75	28	29%
$76-$125	13	13%

Figure 31 - from "Landfill Tipping Fees in California" CalRecycle, 2015.

Based on that information, we extrapolated from $54 per ton (in 2013) to an estimated $69 per ton (in 2022) using that same annual increase (i.e., $1.70 per ton).

CalRecycle's tipping fee report went on to state, *"Based on a small sample of negotiated rates among 22 landfills and various haulers, negotiated rates for MSW disposal at landfills were discounted at 20 of the landfills. …If the negotiated fees are as low as suggested by this preliminary anecdotal research, landfills are likely the cheapest path for materials to flow*

[36] Landfill Tipping Fees in California – 2015 – Publication Number DRR-2015-1520
https://www2.calrecycle.ca.gov/Publications/Details/1520

down. If true, this makes building a competitive recycling and composting infrastructure is very challenging."

The previous paragraph is a good summary of CalRecycle's understanding of the challenges tire recyclers face in California due to the relatively low cost of landfilling.

To provide some additional perspective regarding landfill economics in general, and waste tires in particular, we present the following summary of costs related to waste tire disposal.

Landfill costs vary regionally, and from one facility to another. Thus, the following costs should be considered typical of the overall industry.

Tire Disposal Costs

The total cost of waste tire disposal includes segregation, processing, transportation, and disposal (See **Error! Reference source not found.**). A brief description is presented below.

Estimated Total Disposal Cost per ton of Waste Tires	
Description	**Cost per ton**
Tire Segregation to a Processing Facility	$15
Processing (i.e., shredding)	$30
Transportation to Landfill	$25
Landfill Tipping Fee:	$69
Total:	$139

Figure 32 - Estimated "All-in" tire disposal costs. Source: BRS estimate (See Below).

Tire Segregation

Assumes 3 tons of waste tires transported from tire dealer to tire processing facility. Truck and driver cost $30 per hour and round-trip time is 1½ hours, including loading and unloading. $30 x 1.5hr ÷ 3 tons = $15/ton.

Processing

Assumes shredder costs $150 per hour and can process 10 tons per hour. Wheel Loader and Operator cost $120 per hour and match shredder production in terms of feeding the shredder and loading out processed material. Also includes 2 laborers each at $15 per hour. Combined hourly cost is: ($150 + $120 + $15 + $15) ÷ 10 tons per hour = $30 per ton.

Transportation

Assumes transfer truck hauls 20 tons of shredded tires per load. The hourly cost of truck and driver is $125 per hour, and round-trip time is 4 hours, including time for loading and unloading. $125 per hour x 4 hours ÷ 20 tons = $25 per ton



Figure 33 - Capital costs include landfill liner, etc.

Landfill Tipping Fee

As previously calculated in this White Paper, the landfill tipping fee, including capital costs and operating costs, is estimated at $69 per ton. This represents the gate rate to dispose of waste tires, which includes capital costs (See Figure 33) and

Operating costs (See Figure 34). Commercial customers may pay a lower negotiated rate.

Tire retailers, tire shops, and other organizations that process and dispose of waste tires bear the full cost of disposal, but of course, these costs will ultimately be passed on to individual consumers.

Based on the total estimated cost of $139 per ton, any increase in volume of waste is expected to be paid – by consumers – at this rate.



Figure 34 - Operating Costs include Landfill Machines.

Additionally, municipalities or other organizations that clean up tires that have been illegally disposed of, must also pay that disposal cost.

Based on this estimate, in 2022 consumers, and others paid more than $41,433,000 to dispose of waste tires at California landfills. Similarly, the increased disposal of waste tires from 2021 to 2022 resulted in a cost increase (year over year) of $6,770,000 (See Below).

$$(\mathbf{298,084} - \mathbf{249,377}) \times \$\mathbf{139} \ = \$\mathbf{6,770,000}$$

SUMMARY

The all-in cost for disposing (i.e., landfilling) of waste tires in California is currently estimated at $139 per ton, or approximately $1.39 per tire based on CalRecycle's estimate of 20 pounds per tire. However, because the average tire likely weighs more than 20 pounds, the cost per tire could be even higher.

This includes estimated costs for tire segregation, processing, transportation, and land-filling. It's likely that most recycling alternatives would also include similar – or perhaps additional – steps. The fact that more than half of all waste tires now end up in landfills, is because the final step (i.e., landfilling) is inexpensive compared to other alternatives.

Based on 2022 data, 298,084 tons of waste tires went into California landfills, for an *estimated* total cost of $41,433,676.

Depending on the results of legislation that would require consumers to use tires that are more fuel efficient, it is possible that more waste tires may be generated. Because landfill disposal will likely continue to be the most economical, and thus the most common option, it is reasonable to assume that every ton of waste tires disposed in a landfill will cost California consumers approximately $139.

Several cost scenarios associated with landfilling various quantities of waste tires is shown here (See **Error! Reference source not found.**). These are the "all-in" costs that will ultimately be paid by California consumers.

Cost Impact of Landfilling Waste Tires			
Additional Tons	Add'l Cost****	Add'l Fuel Consumption	
100	$13,900	159	gal
1,000	$139,000	1,590	gal
10,000	$1,390,000	15,900	gal
100,000	$13,900,000	159,000	gal
1,000,000	$139,000,000	1,590,000	gal

Figure 35 - Disposal cost based on various tonnage scenarios.

When all is said and done, the fact remains that market costs are the definitive factor regarding what happens to waste tires in California. Landfills are likely to be the lowest cost option for waste tires for the foreseeable future. This may change organically over time – or it may be pushed artificially by increasing financial subsidies for alternatives to landfill disposal. It's important to remember though, that in either case, consumers will ultimately be paying the bill.

Finally, as previously noted, other collateral issues such as airborne and waterborne particulate will likely increase commensurate with any increase if tire numbers.