Department of Toxic Substances Control

CalEPA
California Environmental Protection Agency

Draft Hazardous Waste Management Report

Implementation of California Health and Safety Code Section 25135

July 2023

Executive Summary

Introduction

In July 2021, Senate Bill 158 (SB 158) was approved and introduced numerous programmatic reforms to the Department of Toxic Substances Control (DTSC). One of the changes requires DTSC to develop Hazardous Waste Management Reports and Plans every three years (in accordance with Health and Safety Code § 25135). This first Report marks the starting point of an iterative process to determine the types of information and additional research needed to guide a comprehensive planning process for hazardous waste management in the state. As such, the main objectives of the first Report are the following:

- Establish a baseline understanding of the management of hazardous waste in the State of California
- Identify data gaps and items that require additional research
- Begin to develop plans to fill data gaps and complete additional research

DTSC conducted multiple outreach efforts in 2022 to encourage stakeholder input into this Report and to guide its research. DTSC established a Report webpage, e-List, introduction video, and an introductory letter that was sent to more than 15,000 interested stakeholders. In the summer of 2022, DTSC held a series of virtual workshops that highlighted research and data collection on three topics: 1) Universal Waste, 2) Manifested Hazardous Waste, and 3) Hazardous Waste Transportation. DTSC also presented to various groups, including members of the BES, representatives from the Department of Resources Recycling and Recovery (CalRecycle), Certified Unified Program Agencies (CUPAs), county representatives, and the United States Environmental Protection Agency (U.S. EPA) Region 9. Additionally, DTSC staff attended numerous meetings and workshops hosted by other groups, including BES, environmental justice organizations, and legislative hearing updates.

This Report provides information about the types and quantities of hazardous wastes generated in the state as well as the destinations and ultimate dispositions of these wastes, utilizing available data from roughly the last decade (January 2010 to May 2022).[1] Information from the Report and future iterations will be used to inform the Hazardous Waste Management Plans (Plans) that will be updated triennially. The Plans will recommend strategies to reduce hazardous waste generation, manage more waste in state, and address issues of concern such as hazardous waste impacts to disadvantaged communities. DTSC will consult with stakeholders and work in

[1] The date range was based on available computer processing capabilities at the start of the project and the data analysis software used.

coordination with the Board of Environmental Safety (BES) throughout the planning process. DTSC will prepare the first Plan by March 1, 2025, and every three years thereafter, for presentation to the Board of Environmental Safety (BES) for approval.

Hazardous Waste Management Report

DTSC's approach to hazardous waste management incorporates the concept of a "hierarchy" of waste management. The basic structure of the hierarchy has source reduction as the highest priority, followed by recycling, treatment (including stabilization), and land disposal.[2] This hierarchy helps to provide the approach that generators should consider when determining how to manage their hazardous waste. In its effort to emphasize source reduction, the state has relied on laws and policies intended to encourage less waste generation.

Hazardous waste control laws were first introduced in California in the 1970s, prior to the U.S. EPA's Resource Conservation and Recovery Act (RCRA). California developed a program of hazardous waste management that was more stringent and broader in scope than the federal program. As a result, many more wastes are identified and managed as hazardous in California than by U.S. EPA or most other states. Specifically, less than 19 percent (3.8 million tons) of hazardous wastes tracked with a manifest in California were classified as hazardous under federal criteria. These are referred to as RCRA hazardous wastes. The remaining 81 percent (more than 17 million tons) are considered hazardous in California but not by U.S EPA. These wastes are referred to as non-RCRA hazardous wastes.

Since the 1980s, California's hazardous waste management policy objective has been to responsibly manage its own hazardous waste within its own borders rather than depend on out-of-state facilities. To provide adequate capacity, the state intended to rely primarily on waste reduction and recycling, and secondarily on new facilities. This emphasis was based on three factors:[3]

1. California had grown a relatively robust waste reduction program.
2. Facility permit applications were actively being processed.
3. Legislative efforts (AB 2948 Tanner and AB 650 Tanner) were moving forward toward hazardous waste facility siting and hazardous waste management planning.

This policy goal has not been realized, and the factors that were identified in the 1980s as being favorable to increasing capacity no longer exist. Only about half (53 percent) of the hazardous waste generated in California since 2010 has been managed in state, with the rest shipped to other states or countries. Further, California no longer has an

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[2] Hazardous waste Management Planning Needs and Practices: A Review of Several State Agency Approaches, US EPA, January 1, 2016

[3] State of California, Capacity Assurance Plan for Hazardous Waste Management, October 1989.

active waste reduction program, there are currently no permit applications for new hazardous waste management facilities, and additional protections for communities near permitted facilities are underway, which may further disincentivize development of additional capacity.

Over the past 40 years, California has experienced a decline in the number of operating hazardous waste facilities that have a full RCRA Equivalent Permit or Standardized Permit – a decrease from more than 400 in 1983 to fewer than 100 in 2021. Conversely, the number of generators appears to have almost doubled since 2010 to nearly 100,000 in 2021. Given the decline in hazardous waste management facilities over time and more stringent requirements for operating permitted facilities, it is anticipated that California's hazardous waste management capacity will be further reduced and that more California-generated hazardous waste will be shipped to other states.

In this first Report, DTSC presents available information regarding hazardous waste generation, disposal, and transportation, and other hazardous waste related topics as required by HSC § 25135. The data are summarized and interpreted for trends in hazardous waste management. Key findings regarding hazardous waste generation, disposal, and other notable findings are included below:

Generation

- Since 2010, the number of hazardous waste generators in California appears to have increased from approximately 55,000 to 94,500 in 2021.[4]
- The annual quantity of all types of hazardous waste tracked with a manifest has ranged from 1.4 million tons to 2.0 million tons since 2010.
- Since 2010, the quantity of manifested RCRA hazardous waste has ranged from 224,600 tons per year to 398,600 tons per year.
- The quantity of manifested non-RCRA hazardous waste fluctuated between 1,091,240 tons per year and 1,680,348 tons per year.
- Preliminary evaluation of RCRA and non-RCRA hazardous waste indicates a decline in generation from 2000 to 2021, which is consistent with prior evaluation that have concluded that the amount of all types of hazardous waste generated in California has decreased over time.[5]
- Three waste streams – contaminated soil, used oil, and other inorganic debris – make up approximately 65 percent of all hazardous waste generated since 2010.

[4] The generator count may fluctuate depending on the database being referenced (HWTS or CERS). This Report utilizes distinct EPA IDs located on manifests that were included in HWTS. Additionally, because California issues identification numbers to both a location and an owner, this may result in an over-estimation of the number of generators.
[5]DTSC, Community Protection and Hazardous Waste Reduction Initiative, November 2017. Weblink

Disposal

- The top three types of destination facilities that wastes are shipped to, either in state or out of state, are land disposal facilities, reclamation or recycling facilities, and incinerators.
- Since 2010, approximately 12.5 million tons (59.2%) of manifested hazardous waste was disposed of in land disposal units, 5.09 million tons (24.2%) was shipped for recycling, and approximately 620,000 tons (2.31%) was incinerated.
- Since 2010, 3.13 million tons (43.9%) of contaminated soil has been managed in California, while 4.00 million tons (56.1%) has been shipped out of state.
- Since 2010, the top three destination states California's generators have shipped hazardous waste to have been Utah (3,158,000 tons (15.2%)), Arizona (2,839,400 (13.4%)), and Nevada (2,169,400 (10.4%)).
- California has two permitted hazardous waste landfills. At the current rate of land disposal in state and out of state, they have an estimated 20 years of permitted capacity remaining. If all RCRA and non-RCRA waste that is destined for land disposal were to remain in California, these two hazardous waste landfills would reach their permitted capacity in 9.5 years.

Other Notable Findings

- The distance between generators and destination facilities ranged from approximately one mile to nearly 2,500 miles, with an average distance of about 500 miles. Further analysis would be needed to estimate related subjects like the annual greenhouse gas emissions from hazardous waste transportation.
- Some hazardous waste generators treat or recycle a significant quantity of waste on site. This reduces the amount of hazardous waste that must be sent off site for treatment or disposal. The degree to which these practices could be expanded requires further research.
- Pollution prevention programs have been successful in reducing specific types of hazardous waste but have not historically resulted in large percentage reductions in overall waste generation.
- Hazardous waste generators, which also frequently store and use hazardous materials, may contribute significant impacts to vulnerable and disadvantaged communities due to their proximity to these communities. Additional research is needed to determine the number of hazardous waste generators located within disadvantaged communities.
- Fifty-five percent of California's permitted hazardous waste management facilities (41 of 74) are located within disadvantaged communities.

- California’s criteria for identification of hazardous waste were developed in the 1970s and early 1980s and rely on assumptions and justifications that must be reviewed to ensure they are consistent with current science and technology.

Future Work

Future planning efforts will provide the opportunity to identify hazardous waste management strategies that maximize the potential for waste reduction and recycling while ensuring protection of public health and the environment. To accomplish this, DTSC has identified four primary areas for future work, based on consideration of public input and statutory requirements:

- Hazardous Waste Criteria
- Waste Reduction
- Capacity Assurance
- Environmental Justice

Hazardous Waste Criteria

DTSC will evaluate California’s current hazardous waste criteria to determine whether they are consistent with current science and technology. This review is a significant effort that will require additional research and collaboration with other internal programs and external agencies like the Office of Environmental Health Hazard Assessment. Evaluation of the criteria has begun and will include an assessment of the differences between California’s criteria and U.S. EPA’s criteria.

DTSC will provide recommendations for future research and various hazardous waste criteria in the Plan.

Waste Reduction

Waste generation data indicate that overall hazardous waste generation has decreased since at least 2000. In an effort to inform future waste reduction priorities, DTSC will conduct research to understand the causes of this decrease. DTSC will then analyze a targeted and intentional approach to continued waste reduction that is focused on specific industry sectors or waste streams rather than establishing a general reduction goal. The aim is that this approach will result in more direct positive impacts on environmental justice communities. It will be important to consider more efficient and sustainable strategies for managing waste, such as on-site treatment, on- and off-site recycling, pollution prevention, safer alternative products, and encouraging a circular economy in California.

While DTSC is not currently resourced to implement a waste reduction program, the Department will provide recommendations in the Plan regarding development of a program and strategies.

Capacity Assurance

Since the 1980s, California's stated intention has been to manage its hazardous waste within its own borders rather than depending on out-of-state facilities. To accomplish this, the state must ensure adequate capacity exists in California.

DTSC will make recommendations in the Plan to identify opportunities to realize this goal.

Environmental Justice

Since the inception of DTSC, the Department has heard multiple concerns from environmental justice communities about the management of hazardous waste and site cleanups. Concerns have included, but not been limited to, the operation and zoning of hazardous waste facilities, cumulative impacts, the transportation of hazardous waste, and the consideration of community input.

DTSC will seek community input from environmental justice communities regarding their concerns relating to the management of hazardous waste, including how it relates to site cleanups. DTSC's Hazardous Waste Plan Unit and Office of Environmental Equity will leverage ongoing outreach efforts across the department to collect information about concerns regarding hazardous waste management. DTSC will use information gathered from these discussions to inform and develop recommendations in the Plan.

Data Gaps and Additional Questions

There are several data gaps that may not be able to be resolved but should be researched. These include but are not limited to:

- The impacts of hazardous waste generators on communities
- The total disposal capacity and throughput capacity of TSDFs
- Quantification of on-site treatment and recycling of hazardous waste
- Complete analysis of data in the Hazardous Waste Tracking System (HWTS) prior to 2010

There are also several additional questions that should be considered in preparation for the Hazardous Waste Management Plan. These include:

- Can non-RCRA contaminated soil safely be disposed of in non-hazardous waste landfills in California?
- How has the limited capacity of incinerators in the United States affected California generators?
- What incentives should be provided to encourage the construction of hazardous waste facilities to treat/recycle emerging waste streams?
- Which waste streams should be targeted for treatment or reduction?

This Report is the first step in the process of creating a comprehensive plan to guide the future of hazardous waste management in the state. California was the first in the nation to implement hazardous waste control laws and now, has a novel opportunity to reexamine how hazardous waste is defined and managed in a way that is both health protective and supportive of an in-state circular economy. To further inform this report and the development of the Hazardous Waste Management Plan, DTSC will collaborate with community stakeholders, regulated businesses, tribes and other government agencies.

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Draft Hazardous Waste Management Report

Implementation of California Health and Safety Code Section 25135

Section 1

1. Introduction and Overview

Senate Bill (SB) 158, which Governor Newsom signed into law in 2021, made several significant changes to the funding and governance of California's Department of Toxic Substances Control (DTSC). In addition to restructuring and increasing the fees that fund DTSC's operations, the bill established a new Board of Environmental Safety (BES) and imposed new reporting and planning requirements on DTSC. Specifically, DTSC is now required to issue a report on the management of hazardous waste in the state every three years, beginning in 2023, and a triennial Hazardous Waste Management Plan based on these reports, beginning in 2025. This report is DTSC's first triennial Hazardous Waste Management Report (Report), which was prepared pursuant to [California Health and Safety Code (HSC) section (§) 25135].

This Report is the starting point of a continuous process of research and development of Hazardous Waste Management Plans. As such, this report:

- Establishes a baseline understanding of the management of hazardous waste in the state of California.
- Identifies data gaps and items that require additional research.
- Begins to develop plans to fill data gaps and complete additional research.

Specifically, this Report provides available information about the types and quantities of hazardous wastes generated in the state as well as the destinations and ultimate dispositions of these wastes. DTSC will use information from this and subsequent Reports to inform the triennial Hazardous Waste Management Plan (Plan). The Plans will recommend strategies for reductions in hazardous waste generation and strategies for managing more waste within the borders of California, and they will also provide insight into issues of concern, such as the impacts of hazardous waste on disadvantaged communities.

DTSC will prepare the first Plan by March 1, 2025, and every three years thereafter, for presentation to the Board of Environmental Safety (BES) for approval. These Plans will be based on Hazardous Waste Management Reports and will serve as:

- Comprehensive planning documents for the management of hazardous waste in the state.
- Sources of useful information to guide state and local hazardous waste management efforts.
- Guides for implementation of DTSC's Hazardous Waste Management Program.

DTSC will provide information about specific items such as waste streams and waste management practices that will be used in hazardous waste management planning. The

Plan will recommend strategies for reductions in hazardous waste generation and disposal and will provide insight into issues of concern. The state will conduct an ongoing review of hazardous waste management practices to learn from past practices, understand howhazardous wastes are managed today, and plan for hazardous waste management in the future.

1.1 Overview of Hazardous Waste Management in California

DTSC's approach to hazardous waste management incorporates the concept of a "hierarchy" of waste management. The basic structure of the hierarchy has source reduction as the highest priority, followed by recycling, treatment (including stabilization), and land disposal.[1]

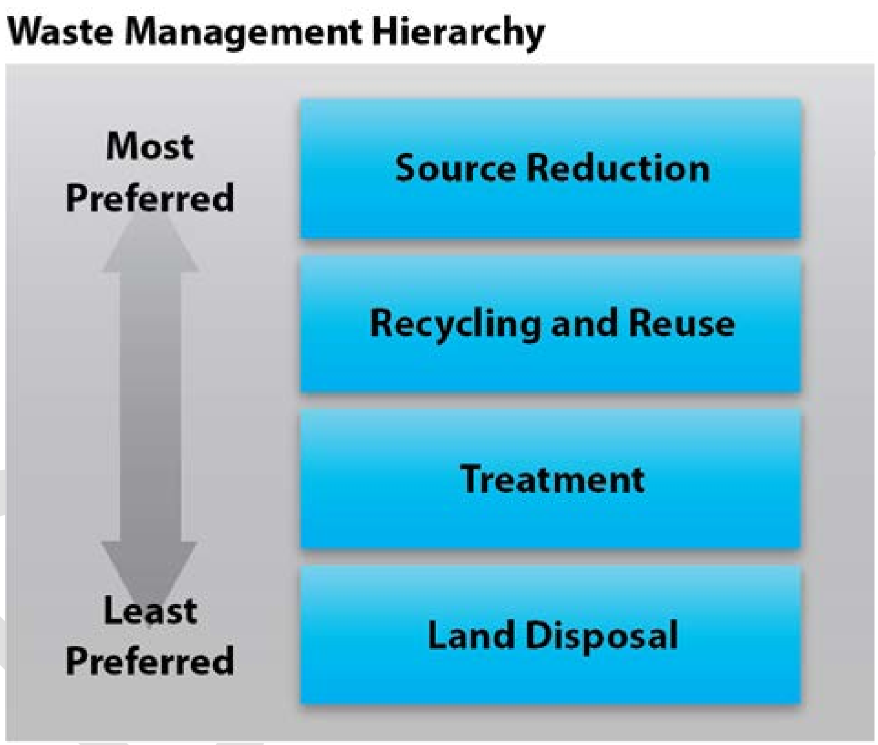

Figure 1.1-1 Waste Management Hierarchy

While this hierarchy helps to provide the steps that generators should consider when they determine how to manage their hazardous waste The Department must account for the fact that some hazardous waste sources cannot be reduced. It may depend on whether or not the hazardous waste is generated from an industrial or manufacturing source or from a site cleanup. The following key considerations need to be addressed: project timeline, quality, effectiveness of chemical substitutions, economic factors, and community input. In an effort to emphasize source reduction over recycling,

[1] Hazardous waste Management Planning Needs and Practices: A Review of Several State Agency Approaches, US EPA, January 1, 2016

treatment, or disposal, the state has relied on laws and policies intended to encourage less waste generation.

1.1.1 Background of Hazardous Waste Management

Americans began recognizing the public health threat posed by improper chemical disposal in the 1970s. Multiple high-profile incidents led to public outcry – Love Canal in New York, A.L. Taylor (Valley of the Drums) in Kentucky, and multiple fires on the Cuyahoga River in Ohio. These incidents – caused by uncontrolled and improper management of hazardous materials and wastes – highlighted the need for specific waste management standards to be protective of public health and the environment.

The United States Congress passed the Resource Conservation and Recovery Act (RCRA) in 1976 to address the increasing problems the nation faced from the growing volume of municipal and industrial waste. RCRA was an amendment to the Solid Waste Disposal Act of 1965, which was the first statute that specifically focused on improving solid waste disposal methods. The first national hazardous waste regulations, implementing the provisions of RCRA, were published in the 1980s by the United States Environmental Protection Agency (U.S. EPA) and established a cradle-to-grave system that regulated the identification, generation, transportation, treatment, storage, and disposal of hazardous wastes. The cradle-to-grave concept centers on tracking hazardous waste from the point of generation, through its transportation, and to its ultimate disposal facility.

RCRA Subtitle C addresses hazardous waste. It established specific requirements for three categories of hazardous waste handlers – generators; transporters; and treatment, storage, and disposal facilities (TSDFs). For TSDFs, these requirements set technical standards for their design and safe operation to prevent the release of hazardous waste into the environment. These requirements also placed restrictions on land disposal practices to ensure that wastes were treated prior to disposal in order to reduce the mobility and/or toxicity of hazardous constituents in a landfill.

U.S. EPA delegates the primary responsibility of implementing the RCRA hazardous waste program to individual states in lieu of U.S. EPA. U.S. EPA's 10 regions also retain authority to administer the RCRA program in all states. A state can seek authorization from U.S. EPA to implement the federal hazardous waste program as long as its program is at least as stringent as RCRA. A state program can also be broader in scope.[2] California is one of 48 states currently authorized to implement RCRA.

California enacted its own Hazardous Waste Control Act (HWCA) prior to RCRA, in 1972. As noted above, the state's hazardous waste program is more stringent and broader in scope than RCRA, meaning California regulates more wastes than U.S. EPA

[2] 42 USC 6926

and has additional regulatory requirements for managing those wastes. The state has held that these additional regulatory requirements are appropriate and necessary to protect California's public health and the environment. In addition, California's policy objective has been to responsibly manage its own hazardous waste within its own borders rather than depending on out-of-state facilities. Needless to say, identifying more waste as hazardous requires more hazardous waste management capacity.

Proper management of hazardous waste minimizes the impacts of that waste on human health and the environment. Having a sufficient number of facilities capable of managing the various types of wastes that are identified as hazardous is a necessity. In other words, capacity is crucial.

California's great need for facilities has been complicated from the beginning by considerations regarding where these facilities would be located. Siting issues have hampered the state's efforts to meet its in-state management goal since the 1970s and 1980s, as have other factors, including challenges in identifying concrete steps to meet waste reduction goals.

Facility Siting

Efforts to address the siting of hazardous waste management facilities in California began with the introduction of several bills in the state legislature in 1981, in response to a perception that California was facing a hazardous waste crisis. Local governments had rejected several proposed hazardous waste management facilities, and numerous land disposal facilities in Southern California had closed. In addition, new restrictions on land disposal required treatment facilities to treat hazardous wastes to a higher standard before they could be disposed of to land. The bills attempted to address how to limit local control over facility siting. Proposals ranged from allowing the state to preempt local siting decisions, to enhancing regional and county planning efforts, to placing some limitations on local control over siting decisions. None of the bills passed.[3]

In 1982, Assembly Bill (AB) 1543 (Tanner) became law, requiring a 16-member Hazardous Waste Management Council (HWMC) to prepare a Hazardous Waste Management Council Plan (HWMC Plan) that would recommend the elements needed in a state hazardous waste management program. The HWMC released its Draft HWMC Plan in January 1984, and its recommendations were included in legislation introduced while the final HWMC Plan was being prepared. That legislation became law as AB 2948 (Tanner) in 1986 after overcoming two gubernatorial vetoes.

Broadly, AB 2948 included:

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[3] Background Paper, AB 2948 (Tanner), Chapter 1504, Statutes of 1986: Preparation of County and Regional Hazardous Waste Management Plans, Hearing of the Assembly Committee on Environmental Safety and Toxic Materials, March 20, 1990

- A schedule to move away from the use of landfills as disposal sites for raw, untreated chemical wastes
- Creation of a set of programs and procedures to facilitate the siting and permitting of alternative hazardous waste management facilities through local-level hazardous waste management planning
- Enhancement of public involvement in permitting.
- An administrative process to appeal local land use decisions.

One of the primary components of AB 2948 was that it authorized counties and regions to prepare comprehensive plans regarding hazardous waste generation and determine present and future needs for facilities to safely manage waste .[4] Another primary component was an appeal process to address local decisions that were based on something other than a compelling need for a facility, a facility's merits or location, or on environmental or public health grounds.

Even though AB 2948 did not mandate the preparation of local hazardous waste management plans, all 58 counties prepared plans, beginning in 1987. By February 1990, DTSC's predecessor, the Toxic Substances Control Program (TSCP) of the Department of Health Services (DHS), had only approved 13 county plans and disapproved 31. Other counties either withdrew their plans, failed to finalize or submit them, or submitted them after the deadline.

Local level hazardous waste management planning resulted in significant disagreements. While funding was one problem, the key factor leading to delays and concerns was the issue of "fair share." DHS required each county's plan to allow for the siting of all types and sizes of hazardous waste facilities, regardless of the types and amounts of hazardous waste a county generated. Counties argued for "fair share" provisions, allowing them to plan only for the types and amounts of waste generated in their geographic area. Counties also proposed allowing local jurisdictions to work together to agree on the location and use of facilities to manage a region's waste. Negotiations between DHS and the counties regarding the siting of hazardous waste facilities delayed the approval of the hazardous waste management plans, and ultimately the statewide plan was not completed.

These disagreements between counties and DHS ultimately affected California's efforts to meet federal requirements under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). CERCLA requires states to provide assurance that they have capacity to treat, destroy, or securely dispose of the waste that is generated within their borders for 20 years in order to maintain funding for CERCLA projects.[5] California's response – the 1989 Capacity Assurance Plan (CAP) –

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[4] Up to 8.5 million was made available to counties and regional governments to prepare these plans (1989 Capacity Assurance Plan).
[5] https://www.epa.gov/hwpermitting/assessment-national-capacity-hazardous-waste-management

asserted that the state had the capacity to manage most of its projected hazardous waste.

In addition, the 1989 CAP reiterated that California's stated policy goal was to responsibly manage its own hazardous waste within its own borders rather than depend on out-of-state facilities. To provide this capacity, the state intended to rely primarily on waste reduction and recycling, and secondarily on new facilities,[6] based on three factors:

1. California had grown a relatively robust waste reduction program.
2. Some facility permit applications were actively being processed.
3. Legislative efforts (AB 2948 Tanner and AB 650 Tanner) were moving forward toward hazardous waste facility siting and hazardous waste management planning.

Waste Reduction

California's hazardous waste reduction effort began in 1984 in DTSC's predecessor, the Toxic Substances Control Program (TSCP) within the Department of Health Services (DHS). The effort grew from two staff with $150,000 in contract funds in 1984 to more than 20 staff and a contract budget of $3.15 million in fiscal year 1988-1989. The program's three primary elements included the Waste Reduction Unit, the Resource Recovery Unit, and the Technology Clearinghouse Unit. These three elements of the waste reduction program focused on:

- Managing a Hazardous Waste Reduction Grant Program.
- Contracting for waste audit studies to assist California's smaller businesses.
- Providing technical assistance to industry on ways to reduce hazardous waste.
- Recycling and recovery of resources that might otherwise be lost to land disposal.
- Acting as a central point of technical information on source reduction, recycling, and treatment technologies and strategies.

By 2012, these programs were seen by some as ineffective at reducing waste, and DTSC redirected resources into other areas and initiatives, including the Safer Consumer Products program and implementation of more stringent requirements for permitted hazardous waste facilities.

Hazardous Waste Management Facility Applications

Although waste reduction and recycling would theoretically minimize the need for additional waste management capacity, the state recognized the need for some additional capacity, specifically for hazardous wastes that went to land disposal without prior treatment. By 1987, the state was actively processing permits for multiple new facilities:

[6] State of California, Capacity Assurance Plan for Hazardous Waste Management, October 1989.

- 15 treatment facilities in progress,
- 3 commercial disposal facilities with permit applications in progress, and
- 30 facilities with permit applications in progress.

California's 1989 CAP determined that, even with newly permitted facilities, the state needed additional hazardous waste management capacity. This left generators of hazardous waste in a vulnerable position because they had little choice as to where to dispose of their waste. There was a need to build new facilities to increase competition in the hazardous waste management marketplace and to allow for additional reserve capacity for emergency use.

Legislative Efforts - Hazardous Waste Management Planning

The 1989 CAP identified capacity shortfalls for several waste management categories but cited two key pieces of legislation as actions California was taking to address this gap:

- AB 2948 (Tanner) – County Hazardous Waste Management Plans
- AB 650 (Tanner) – State Hazardous Waste Management Plan

The county-led hazardous waste management planning effort, discussed earlier in this section, was seen as an opportunity for local and state governments to assess and accommodate current and future needs for facilities.

AB 650 required DTSC's predecessor (TSCP) to prepare a State Hazardous Waste Management Plan (State Plan) to coordinate and enhance the county plans to ensure statewide needs were met. The State Plan was required to be reviewed annually and to be revised every three years. The coordination the State Plan provided was seen as crucial to effective hazardous waste management planning, because local facility siting decisions may not adequately consider the needs of the state as a whole. The State Plan was intended to identify areas or regions where new capacity was needed and the types of facilities that should be sited and constructed. The State Plan was also to include a schedule of recommended actions for implementing the State Plan at the state, regional, and local levels.

The State Plan was drafted but was never completed, as only a few of the county plans it was to coordinate and enhance were ever approved.

1.2 Current State of Hazardous Waste Management in California

Over the past four decades, the number of permitted hazardous waste facilities in California has decreased. In 1980, more than 400 permitted hazardous waste management facilities were in operation, while currently there are fewer than 100. There are only two operating hazardous waste landfills in California, and a third is undergoing closure. Also, California does not have any commercial facilities for hazardous wastes that require incineration. In contrast, the number of hazardous waste generators in California has increased – nearly doubling in just the last decade, from approximately 55,000 generators in 2010 to approximately 94,500 in 2021.

Recent attention and legislation have focused, not on increasing capacity, but on stricter regulation of permitted hazardous waste facilities and regulating more wastes. Senate Bill 673 (2015) focused on developing additional permitting requirements and included more stringent consideration of a facility's compliance history. SB 673 also focused on increasing protection for vulnerable communities through additional permit criteria to address cumulative impacts[8] and to establish setback distances from locations like schools, day care centers, hospitals, and residences.

While these are important regulations, as protection of our most vulnerable communities is paramount, their potential impact on the number of permitted hazardous waste facilities is an important consideration for the Plan to further examine.

In 2013, DTSC announced a goal to reduce by 50 percent the amount of hazardous waste disposed of in California landfills by 2025. This announcement coincided with the approval of the expansion of one of the state's two hazardous waste landfills. DTSC began to work in conjunction with stakeholders, including impacted communities and industries, to develop a strategy to achieve this goal. However, DTSC found it difficult to sustain the efforts without additional resources, so it sought a Budget Change Proposal (BCP) .

The BCP was approved in 2015 and DTSC launched a two-year Community Protection and Hazardous Waste Reduction Initiative (CPHWRI) to develop, implement, and evaluate projects designed to reduce the amount of waste generated in California. The $840,000 effort resulted in a 2017 CPHWRI report, which provided a starting point for the analysis of hazardous waste generation.[9] The report's analysis of waste streams generated in California led to recommendations for the prioritization of four streams for reduction – contaminated soil, organic solvent wastes, petroleum refinery wastes, and lead-acid battery waste. The CPHWRI report also proposed the study of new technologies that could reduce these waste streams.

[8] Cumulative impacts are meant to consider the total burden – positive, neutral, or negative – from chemical and non-chemical stressors and their interactions that affect the health, well-being, and quality of life an individual, community, or population at a given point in time or over a period of time. U.S. EPA, External Review Draft Cumulative Impacts Recommendations for ORD Research, USEPA Office of Research and Development, January 2022

[9] California, Department of Toxic Substances Control, "Community Protection and Hazardous Waste Reduction Initiative." (November 2017).

After the completion of the two-year CPHWRI, the state legislature began to more seriously consider various bills related to hazardous waste management planning and the formation of a board for its oversight. These efforts eventually led to the reforms identified in SB 158, which also formed the Board of Environmental Safety (BES). SB 158 also established the requirements for these Hazardous Waste Management Reports and future Hazardous Waste Management Plans.

1.3 Future Considerations for Hazardous Waste Management in California

The history described above identified common factors related to hazardous waste reduction, facility siting, land use, and zoning. Recent legislation has focused downstream on waste management facilities and the regulation of additional waste streams. However, additional attention could be given upstream, on matters like incentives to facilitate moving away from the use of toxic materials, educating generators on how more on-site treatment or recycling can occur, a review of whether adopting some federal exclusions can safely allow some wastes to be managed differently that full hazardous waste management requirement and encourage technical support for waste reduction technologies.

In the past, DTSC had a greater focus on upstream hazardous waste management issues, with waste reduction programs and a Pollution Prevention Program. However, those programs have been disbanded or their funding reallocated. Currently, DTSC's Safer Consumer Products (SCP) Program looks upstream to promote the use of safe chemicals in consumer products, but its focus is largely outside of hazardous waste generation and management. DTSC's shift from hazardous waste reduction to the promotion of safer chemicals created a gap in the Hazardous Waste Management Program because it removed the Department's waste reduction tools. More significantly, institutional knowledge and expertise regarding manufacturing waste streams has been lost through attrition or staff assigned to other programs throughout DTSC.

The previous waste reduction efforts were discontinued because they did not produce reductions large enough to be seen as effective. However, these programs did serve a purpose and should be considered an important part of any waste management program. Developing a robust and strategic approach to waste reduction would require additional resources but should be considered. Waste reduction and recycling expertise will be especially crucial to DTSC's ability to adequately manage and reduce growing waste streams like lithium-ion batteries and photovoltaic modules. Waste reduction expertise will also be important to explore potential waste reduction opportunities for the largest waste stream through on-site treatment of contaminated soil.

Even if California succeeds at reducing the amount of waste generated, the state must still manage the hazardous waste that exists today and will continue to exist in the future. If California is to manage its own hazardous waste, it will need new facilities, and new types of facilities. This is especially true as California seeks to transition from a traditional, linear economy to a circular economy.

In a linear economy, waste products are commonly disposed of in landfills, while in a circular economy, they are recycled back into the production process. A circular economy has benefits and challenges. While fewer raw materials are needed and less hazardous waste goes to landfills, facilities that manage hazardous waste must adapt in order to return recoverable waste back into production processes. If those required adaptations result in an onerous approval process, California will be forced to rely on other states to manage its hazardous waste, regardless of the type of economy – linear or circular.

One element of future evaluations will be California's evaluation of its hazardous waste criteria. This subject is discussed extensively in Section 8 of this Report.

This Hazardous Waste Management Report and the subsequent Hazardous Waste Management Plan provide an opportunity for public discourse as we re-evaluate California's management of hazardous waste.

1.4 Report Organization

In accordance with California HSC § 25135(b), this report includes an analysis of available data related to hazardous waste generation, transportation, treatment, storage, and disposal. This report is organized in the following manner:

- Section 1 – Introduction and overview of the Hazardous Waste Management Report and Plan.
- Section 2 – Discussion of the generation of hazardous waste from various sources, ranging from industrial manufacturing to household hazardous wastes.
- Section 3 – Discussion of where California's hazardous wastes are stored, treated, recycled, or disposed of, both in- and out-of-state
- Section 4 – Discussion of destination facilities and areas surrounding these facilities.
- Section 5 – Discussion of the off-site transportation of hazardous waste by air, rail, highway, or water.
- Section 6 – Overview of national and international pollution prevention programs.
- Section 7 – Analysis of the use of fees and their ability to influence or encourage reduction in the generation of hazardous wastes.
- Section 8 – Analysis of the criteria used to identify wastes as hazardous under state law.
- Section 9 – Discussion of next steps and additional research.

Each section includes an analysis of the various relevant hazardous waste streams, data in the form of figures or maps, and identification of data gaps where information is not readily available. A summary of potential next steps will be discussed related to the further development of the Hazardous Waste Management Plan due in March 2025.

Department of Toxic Substances Control

CalEPA
California Environmental Protection Agency

Draft Hazardous Waste Management Report

Implementation of California Health and Safety Code Section 25135

Section 2

2. Generation of Hazardous Waste

This Report divides California's hazardous waste generation into three main categories:

- Waste Treated On Site and Recycled On Site
- Manifested Hazardous Waste
- Unmanifested Hazardous Waste

Historically, the primary focus of analysis has been on manifested hazardous waste streams. However, this Report also incorporates available information on unmanifested waste, which is hazardous waste that is not required to be tracked by a manifest. This includes, but is not limited to, a large quantity of waste that is treated on site, recycled on site, or managed under alternative management requirements.

In accordance with Health and Safety Code (HSC) section (§) 25135(b)(1), this section includes available information and discussion about hazardous waste streams currently being generated, historically generated, and expected to be generated in California. In addition, this section presents information for the following elements:

- The county in which each hazardous waste stream is generated.
- The destination to which each hazardous waste stream is shipped.
- The amount of hazardous waste disposed to land in California and other states.
- The amount of hazardous waste treated within the state and other states.
- The amount of hazardous waste regulated under the federal Resource Conservation and Recovery Act (RCRA).
- The amount of hazardous waste regulated only in California.
- An estimate of the types and volumes of hazardous wastes generated but not required to be manifested.

Numerous sources were used to compile the required information and are discussed in the relevant subsections below.

2.1 Defining Hazardous Waste

Hazardous waste is a waste with properties that make it potentially dangerous or harmful to human health or the environment. The universe of hazardous wastes is large and diverse. Not all hazardous wastes are equal, and they have various potential impacts to human health and the environment based on how they interact with humans and the environment. Hazardous wastes can be liquids, solids, or contained gases. They can be the wastes generated from manufacturing processes, discarded used materials, or discarded unused commercial products, such as cleaning fluids (solvents) or pesticides. Hazardous waste can be discarded products collected from households or soil from construction projects or remediation projects.

Both nationally and in California, it is the responsibility of the individual generating the waste to determine whether it meets the criteria of hazardous waste as defined in federal and state regulations. Therefore, the generator's knowledge and expertise of the waste they generate is critical to characterizing waste and making accurate waste determinations. Hazardous waste is defined in California Code of Regulations (Cal. Code Regs.), title 22 (tit. 22), § 66261.3. Hazardous waste is classified as either being subject to RCRA, found in 40 Code of Federal Regulations (CFR), or subject to HSC and Cal. Code Regs., tit. 22.

Listed Hazardous Waste

In California, there are five types of wastes organized into five lists – F-list, K-list, P-list, U-list, and M-list.

The F-list identifies wastes from many common manufacturing and industrial processes, such as solvents that have been used for cleaning or degreasing. Since the processes producing these wastes occur in many different industry sectors, F-listed wastes are referred to as wastes from non-specific sources. Non-specific means they do not come from one specific industry or one specific industrial or manufacturing process. The F-list appears in the hazardous waste regulations in 22 CCR section 66261.31.

The K-list includes certain wastes from specific industries, such as petroleum refining or pesticide manufacturing. Examples of source-specific wastes include certain sludges and wastewaters from treatment and production processes in these specific industries. The K-list appears in the hazardous waste regulations in 22 CCR section 66261.32.

P-list and U-list include specific commercial chemical products that have not been used but will be, or have been, discarded. Industrial chemicals, pesticides, and pharmaceuticals are examples of commercial chemical products that appear on these lists and become hazardous waste when discarded. P-listed waste identifies acutely hazardous wastes that are known to be harmful even in smaller quantities. The P-list and U-list appear in the hazardous waste regulations in 22 CCR sections 66261.33(e) and (f).

The M-list, found in 22 CCR section 66261.50, includes the following wastes containing mercury (Hg):

- M001: Mercury light switches in motor vehicles and salvaged vehicles that contain such switches prior to crushing, baling, shredding, or shearing.
- M002: Other mercury switches in products, including appliances.
- M003: Mercury-containing lamps and products with lamps, except liquid-crystal displays (LCDs) with mercury backlighting.

- M004: Mercury-added novelties.

Characteristic Hazardous Wastes

Wastes are considered hazardous if they exhibit any of the four characteristics of a hazardous waste as defined in 22 CCR sections 66261.21 through 66261.24 – ignitability, corrosivity, reactivity, and toxicity.

Ignitable wastes can create fires under certain conditions, undergo spontaneous combustion, or have a flash point of less than 60°C (140°F). Used solvents are an example of ignitable waste. The characteristic of ignitability is defined in 22 CCR section 66261.21.

Corrosive wastes can include solids and liquids and are strong acids or bases or wastes that produce acidic or alkaline solutions. Wastes are considered corrosive when they have a pH less than or equal to 2.0 or greater than or equal to 12.5. A waste may be corrosive if it is able to corrode metal containers, such as storage tanks, drums, and barrels. The characteristic of corrosivity is defined in 22 CCR section 66261.22.

Reactive wastes are unstable under normal conditions.[1] They can cause explosions or release toxic fumes, gases, or vapors when heated, compressed, or mixed with water. Examples include lithium-sulfur batteries and unused explosives. The characteristic of reactivity is defined in 22 CCR section 66261.23.

Toxic wastes are harmful or fatal when ingested or absorbed (e.g., wastes containing mercury, lead, DDT, PCBs, etc.). When toxic wastes are improperly disposed of, the toxic constituents may leach from the waste and pollute groundwater. The characteristic of toxicity is defined in 22 CCR section 66261.24.

Used Oil

In California, waste oil and materials that contain or are contaminated with waste oil are usually regulated as hazardous wastes if they meet the definition of used oil in HSC § 25250.1:

[1] Normal conditions refer to standard set of conditions established at standard temperature and pressure (STP). The most used standards are those of the International Union of Pure and Applied Chemistry (IUPAC) and the National Institute of Standards and Technology (NIST). NIST defines STP as absolute pressure of 1 atm (101.325 kPa, 14.696 psi) and 20 degrees Celsius (293.15 degrees Kelvin, 68 degrees Fahrenheit).

> "Any oil that has been refined from crude oil, or any synthetic oil, that has been used and, as a result of use, or as a consequence of extended storage or spillage, has been contaminated with physical or chemical impurities."

Used oil is regulated under RCRA but not as a hazardous waste.[2] In other words, this waste stream is regulated as a hazardous waste in California but not under RCRA, the federal hazardous waste program.

2.2 Waste Treated On Site and Recycled On or Off Site

Health and Safety Code § 25135(b)(1)(G)(i)(ii) requires an estimate of the types and volumes of hazardous waste that are treated on site and recycled on or off site. The California Environmental Reporting System (CERS) contains information about specific facilities that treat hazardous waste on site and facilities that recycle on or off site. However, the design of the current CERS database does not make it possible to efficiently estimate the types and volumes of hazardous waste treated on site or recycled on site. Therefore, DTSC is gathering this data manually.[3]

Through this data gathering, DTSC has identified generators that treat hazardous waste on site or that report recycling on site in approximately 40 (70%) of California's 58 counties. This includes more than 500 (28%) of the potential 1,950 generators that conduct these activities. DTSC estimates that this 28% of generators may represent more than 2.7 billion gallons of waste which equates to an estimated 11 million tons of waste. Among the processes used to treat or recycle waste include are the distillation of solvents, neutralization of acidic or basic wastewaters, separation of oily materials for return to refinery processes, and treatment of cyanide wastewaters at plating facilities. CalEPA is currently updating CERS in a project known as CERS NextGen. The Department plans to work with CalEPA to see if this data can be more readily retrievable. The Waste Treated On Site, Waste Recycled On Site, and CERS NextGen sections below discuss these topics in more detail.

Other databases, such as U.S. EPA's Toxic Release Inventory, may include similar information but have not yet been explored.

2.2.1 Waste Treated On Site

Hazardous waste treatment is "any method, technique, or process which changes or is designed to change the physical, chemical, or biological character or composition of any

[2] Under RCRA, used oil is regulated under its own regulatory provisions found in 40 CFR Part 279 and not as hazardous waste found in 40 CFR 260.
[3] The quantity of waste that each entity is allowed to treat on site and the amount a facility reports that it recycles on site is recorded.

hazardous waste or any material contained therein or removes or reduces its harmful properties or characteristics for any purpose including, but not limited to, energy recovery, material recovery or reduction in volume."[4]

U.S. EPA allows generators to treat their waste on site in tanks or containers without a permit if they meet certain requirements. However, California requires any person who treats hazardous waste to obtain a hazardous waste facility permit or other grant of authorization.

California has a five-tier permitting program depending on the complexity of the facility and the extent of any treatment performed. The five tiers are:

- Full RCRA Permit
- Standardized Permit Tier[5]
- Permit by Rule (PBR) Tier[6]
- Conditional Authorization Tier[7]
- Conditional Exemption Tier[8], which includes four subcategories:
    - Conditionally Exempt Small Quantity Treatment (CESQT)[9]
    - Conditionally Exempt Specified Wastestream (CESW)[10]
    - Conditionally Exempt – Limited (CEL)[11]
    - Conditionally Exempt Commercial Laundries (CECL)[12]

The full RCRA permit applies to off site treatment, storage, and disposal of RCRA and some non-RCRA waste.

The standardized permit tier applies to treatment and storage facilities that do not require a full RCRA permit,[13] such as an off-site facility that manages non-RCRA hazardous waste in a tank or container.

The PBR tier, conditional authorization tier, and conditional exemption tier allow for on-site treatment of hazardous wastes that are classified as non-RCRA and RCRA-exempt and only if those wastes are generated on site and treated on site. RCRA- exempt wastes are those wastes where EPA would not require a permit to treat. Facilities that treat hazardous waste under these tiers are required to notify their local Certified Unified

[4] Cal. Code Regs., tit. 22, § 66260.10
[5] HSC § 25201.6
[6] Cal. Code Regs., tit. 22, § 67450.1 through § 67450.13
[7] HSC § 25200.3
[8] HSC § 25201.5
[9] HSC § 25201.5(a)
[10] HSC § 25201.5(c)
[11] HSC § 25201.14
[12] HSC § 25144.6(c)
[13] HSC § 25201.6

Program Agency, or CUPA. CUPAs are local agencies certified by CalEPA to implement and enforce six hazardous waste and hazardous materials regulatory management programs.[14]

The programs that the CUPAs implement are:

- Aboveground Petroleum Storage Act (APSA) Program
- California Accidental Release Prevention (CalARP) Program
- Hazardous Materials Business Plan (HMBP) Program
- Hazardous Material Management Plan (HMMP) and Hazardous Material Inventory Statements (HMIS) (California Fire Code)
- Hazardous Waste Generator and Onsite Hazardous Waste Treatment (tiered permitting) Programs
- Underground Storage Tank Program

The PBR tier applies to onsite treatment of non-RCRA and exempt RCRA hazardous wastes that pose multiple hazards and at higher volume than the conditional authorization and conditional exemption tiers.

The conditional authorization tier applies to single-hazard wastes. Each treatment unit can treat no more than 5,000 gallons or 45,000 pounds in a calendar month.[15]

The CESQT subcategory is for generators that treat no more than 500 pounds, or no more than 55 gallons, of hazardous waste in any calendar month.

The following waste streams are eligible for on-site treatment:[16]

- Aqueous wastes with Chromium VI
- Aqueous wastes with metals
- Aqueous wastes with organic compounds listed in Cal. Code Regs., tit. 22, § 66261.24(a)(1)(B) or (a)(2)(B)
- Aqueous wastes with organic compounds not listed and containing less than 10% total organic carbon and less than 1% volatile organic compounds

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[14] "What Is a CUPA?" *What Is a CUPA?*, California CUPA Forum, Website Link.
[15] Department of Toxic Substances Control, and California Community Colleges. "Module V: Hazardous Waste Treatment: Tiered Permitting." *California Compliance School Hazardous Waste Generator Training Student Workbook*, 2019th ed., 2019, pp. 190–193.
[16] On Site Tiered Permitting Flowchart

- Wastewater treatment sludges, solid metal objects, metal workings containing or contaminated with metals and dusts containing less than 750 parts per million (ppm) metal
- Sludges (wastewater treatment and other types), solid metal objects, dusts, metal workings containing or contaminated with metals
- Alum, gypsum, lime, sulfur, or phosphate sludges
- Waste listed in Cal. Code Regs., tit. 22, § 66261.120 which meet the criteria and requirements for special waste classification
- Special wastes
- Inorganic acid or alkaline wastes
- Corrosive waste from the regeneration of ion exchange residues used to demineralize water
- Acid/alkaline wastes corrosive due to presence of food products and generated by standard industrial code (SIC) group 20[17] [18]
- Acid/alkaline wastes from specified labs
- Acid/alkaline wastes from biotechnology
- Soils contaminated with metals
- Used oil, unrefined oil waste, mixed oil
- Oil mixed with water, oil/water separation sludge
- Used oil mixed with water
- Containers 119 gallons or less in capacity
- Aerosol cans
- Resins
- Photographic waste
- Dry cleaning wastes hazardous solely due to percloroethylene (PCE)
- Commercial laundry facilities
- QA labs[19]
- QC labs[20]
- Wastestream/technology combination certified by DTSC
- Technology certified by DTSC
- Consolidation from remote sites
- Cyanide treatment
- Household Hazardous Waste (HHW)

[17] SIC Group 20 is the Food and Kindred Products group and includes “establishments manufacturing or processing foods and beverages for human consumption”.
[18] Major Group 20: Food And Kindred Products
[19] Quality assurance
[20] Quality control

2.2.1.1 Limitations on Data for Waste Treated On Site

The California Environmental Reporting System (CERS) contains information about specific facilities that treat hazardous waste on site. Facilities submit information on the waste type, quantity, and treatment type for each hazardous waste treated on site. Facilities may submit more than one element; that is, one facility can submit four PBR-tier wastes and one CESW-tier waste, for example. The current CERS system does not have detailed reports available that include all information required by HSC § 25135(b)(1)(G)(i). However, it is possible to produce summary reports.

These summaryreports include data gaps, such as the quantity, waste type, or type of treatment each facility performs. To determine a facility's permit type, waste type, allowable quantity, and treatment type, one must access each facility individually on the CERS website. In addition, each facility describes the specific waste type and the treatment process in narrative form, and the names and waste types in the narrative do not match the RCRA/non-RCRA code system used in the Hazardous Waste Tracking System (HWTS).

An additional data gap with the CERS system is that it does not include the actual amount of waste treated on site, instead listing only the amount allowed to be treated per month.

To fulfill the requirements of HSC § 25135(b)(1)(G)(i), DTSC consulted with the CalEPA CERS team to troubleshoot solutions for efficiently accessing information about waste treated on site. One potential solution discussed was to use an existing database management system to access facility information instead of the CERS database. However, this would still require manually adding the information to a spreadsheet to find total quantities of waste treated and treatment types.

A second solution discussed was for the CERS team to produce an "ad hoc" report on facilities that treat hazardous waste on site. The report would include facility name, EPA ID, permit type, hazardous waste type, treatment method, quantity treated, and reporting dates. However, the CERS team was not able to provide this report.

A third option explored involved reviewing the CalEPA Regulated Site Portal for information pertaining to facilities that treat waste on site. The portal contained 1,240 sites that identified as on-site hazardous waste treatment facilities as of July 2022. These 1,240 sites can be filtered by county. However, this only provides the number of facilities that identify as on-site treatment facilities and does not give a total quantity of waste treated on site.

One alternative to accessing databases on an as-needed basis would be to request information from CUPAs on an annual basis. A survey that includes waste types and amounts on a local level would provide some insight into the types and amounts of waste treated on site statewide. However, CUPAs already have an extensive workload and may be unable to take on additional tasks. Therefore, potential downsides to this method would be lack of response to the survey or late survey results, which could result in data gaps. In addition, a new database would be needed to track responses.

As noted above, CalEPA is working on a CERS NextGen project that may enable easier reporting of certain information for CERS users. CalEPA has involved the regulatory agencies that have data in CERS, including DTSC's Enforcement staff, to participate in this project. The Hazardous Waste Management Plan team provided the CERS team with a list of suggestions, including efficient access to the following: facilities that treat waste on site; business name; EPA ID; permit type; waste type; treatment type; quantity of waste, including the amount allowed and the amount actually treated; and reporting dates. The CERS NextGen project is projected to be completed in 2025.

2.2.2 Waste Recycled On Site or Off Site

Recyclable material is "a hazardous waste that is capable of being recycled, including, but not limited to, any of the following:

- (a) A residue
- (b) A spent material, including, but not limited to, a used or spent stripping or plating solution or etchant
- (c) A material that is contaminated to such an extent that it can no longer be used for the purpose for which it was originally purchased or manufactured
- (d) A byproduct listed in Cal. Code Regs., tit. 22, § 66261.31 or § 66261.32
- (e) Any retrograde material that has not been used, distributed, or reclaimable through treatment by the original manufacturer or owner by the later of the following dates:
    - a. One year after the date when the material became a retrograde material
    - b. One year after the material has been returned to the original manufacturer[21]

A recycled material is conditionally excluded from the definition of a hazardous waste. HSC § 25143.2 states that a "recycled material that is managed in accordance with HSC § 25143.9 and is or will be recycled by any of the following methods shall be excluded from classification as a waste:

[21] Cal. Code Regs., tit. 22, § 66260.10

(a) Used or reused as an ingredient in an industrial process to make a product if the material is not being reclaimed[22]
(b) Used or reused as a safe and effective substitute for commercial products if the material is not being reclaimed
(c) Returned to the original process from which the material was generated, without first being reclaimed, if the material is returned as a substitute for raw material feedstock, and the process uses raw materials as principal feedstocks

2.2.2.1 Limitations of Waste Recycled On Site or Off Site Data

Information on facilities that recycle on site and off site can be found in reports each business submits to CERS. These recyclable materials reports (RMRs) contain information for a two-year reporting period, including the business name, EPA ID, material recycled on or off site, and quantity recycled on site. Businesses fill out RMRs either by hand or typing and submit them in portable document format (PDF) into the CERS database.[23]

A significant issue related to RMRs is whether the information reported is an accurate reflection of legitimate recycling. Recycling of hazardous waste is allowed through exclusions or exemptions,[24] which are conditional and self-implementing. Generators that recycle waste on site or off site are required to identify which exclusion or exemption applies to the activity they are conducting, pursuant to California Health and Safety Code 25143.2. However, DTSC has not reviewed all RMRs to determine whether recycling exclusions and exemptions are correctly applied in all cases or how frequently there are errors. Further, the activities of generators and the information they report in RMRs falls under the purview of CUPAs.

Retrieving the information in RMRs is a cumbersome process that does not always yield the necessary results. As of June 2022, the only way to retrieve information is to download the RMR associated with each business from the CERS website. To do this, one must first select each facility's identification number, open the facility summary page, find the "Submittals" section, which lists several categories of submittals, and then select "Recyclable Materials Reports" . There, the RMR for a single facility is available

[22] Cal. Code Regs., tit. 22, § 66260.10: A material that is processed to recover a usable product, or that is regenerated

[23] "UPCF Recyclable Materials Report." UPFC, 1999. A blank RMR report is available here

[24] Generally, an "excluded" material is a material that is excluded from classification as a waste. Therefore, it is not subject to most hazardous waste management requirements. An exempted material is a material that remains a waste but is exempted from certain hazardous waste management requirements. RCRA includes a total of 44 exclusions. However, California only has eight operative exclusions as California's program is more stringent.

as a downloadable file, but it can be large and unwieldly. A facility can recycle multiple materials on site, and each material must have its own page in the RMR. In addition, parts of the RMR are narrative. The narrative nature of the information in the RMR makes it difficult to identify and quantify the different types hazardous wastes that are recycled.

To fulfill the requirements of HSC § 25135(b)(1)(G)(ii), DTSC consulted with the CERS team to troubleshoot solutions for accessing RMR reports in an efficient manner. One potential solution discussed was to use a SQL Server to access every RMR without the need to download each PDF. However, this would still require manually adding the information to a spreadsheet to find total quantities of material, types of material, and the recycling process used.

A second solution discussed was for the CERS team to produce an ad hoc report detailing facilities that submit RMRs. The report would include facility name, EPA ID, permit type, material type, recycling method, quantity recycled, and reporting dates. DTSC is still working with the CERS team on solutions to fulfill the recycled on site requirements of HSC § 25135. In the meantime, DTSC has begun compiling on-site recycling data on a county-by-county basis, but this work will not be complete for this draft of the Report.

As noted above, CalEPA's CERS team is working on a CERS NextGen project that would enable easier reporting of certain information to stakeholders. DTSC provided the CERS team a suggested list of items that would fulfill the recycled on site requirements of HSC § 25135.

2.3 Manifest System and Data Sources

DTSC's Hazardous Waste Tracking System (HWTS), which uses data from hazardous waste manifests, is the primary source of information used for manifested hazardous waste in this Report. Generators of hazardous waste are required to begin a manifest when shipping waste off site.[26] They must include information about the waste, such as the quantity, the type of container used to transport it, and waste codes.[27] Hazardous waste transporters[28] and destination facilities[29] are also required to complete portions of the manifest.

[26] Cal. Code Regs., tit. 22, § 66262.20
[27] Cal. Code Regs., tit. 22, § 66262.23
[28] Cal. Code Regs., tit. 22, § 66263.20
[29] Cal. Code Regs., tit. 22, § 66264.71

When completed, the manifest includes information on the hazardous waste type, the quantity of waste being transported, instructions for handling the waste, and signature lines for all parties involved. Each party that handles the waste signs the manifest and retains its own copy. Once the waste reaches the destination, the receiving facility returns a signed copy of the manifest to the generator, confirming that the waste was received by the designated facility. In this way, each load of hazardous waste is tracked from its generation to its end point.

Prior to 2018, manifests were completed on paper forms instead of the electronic manifest system now available. Today, generators still have the option of completing a manifest with paper or using the electronic system.

Information from each manifest is entered into the U.S. EPA's tracking database (RCRAInfo) every day, and DTSC then downloads that information into HWTS. Between 440,000 and 610,000 hazardous waste manifests have been generated annually in California since 2010 (Appendix B).

Data within HWTS contains hazarous waste manifest information from 1993 to present. A review of the underlying data, conducted in preparation for this Report, has revealed errors that appear to have resulted in an overcount of the quantity of waste reported in the HWTS. Approximately 2,180 manifests appeared to include some kind of error, which has resulted in an overcount of 9,246,300 tons of hazardous waste since 2010.

Generally, these errors were due to administrative issues on the manifests (e.g., incorrect units, misplaced decimals, incorrect coding, etc.), and a list of the errors found has been sent to DTSC's HWTS group. The DTSC HWTS group will correct errors over time through a manifest correction process, in coordination with U.S. EPA.

To ensure more accurate information in this Report, a formulaic data adjustment method has been used to reduce the effects of these errors. A full discussion of the data adjustment methodology is included in Appendix B.

As data corrections are applied to manifests with errors within HWTS, the frequency of data adjustments will be minimized. This Report incorporates adjusted HWTS data from 2010 to May 2022. The HWPlan unit is working to incorporate adjusted HWTS data from 1993 to present for future analysis, but this information is unavailable for this Report.[30]

[30] The date range was based on available computer processing capabilities.

2.3.1 Identification of Manifested Hazardous Waste Streams

As California is authorized by U.S. EPA to implement the federal (RCRA) hazardous waste program, California regulates both RCRA hazardous wastes and non-RCRA hazardous wastes (those wastes identified as hazardous in California). Both federal and state regulations are used to make these determinations. Two sets of waste classification regulations are used in California to determine whether a material is a hazardous waste: federal and state.

Federal hazardous waste laws were enacted in 1976 by RCRA and the first regulations that established the hazardous waste management system were enacted in 1980.These regulations are found in title 40 CFR, Parts 260 – 273.

California hazardous waste laws were enacted in 1972 and are now included in HSC, Division 20, Chapter 6.5 (Hazardous Waste Control Law). Regulations adopted from the HSC are found in California Code of Regulations, division 4.5, title 22.

In California, as in all states, it is the responsibility of waste generators to determine whether the waste they generate is considered a hazardous waste.[31] In this system, a hazardous waste is determined to be hazardous based on federal requirements (RCRA) or state requirements (non-RCRA). RCRA wastes and some non-RCRA wastes are required to be tracked from the point of generation ("cradle") to the point of disposal ("grave").

The hazardous waste manifest system is the tracking method used to track RCRA hazardous wastes and some non-RCRA hazardous wastes. The Uniform Hazardous Waste Manifest (manifest) is the shipping document that travels with hazardous waste from the point of generation, through transportation, to the final treatment, storage, and disposal facility (TSDF). As such, information regarding hazardous waste streams is presented in two main subsections below: manifested waste and unmanifested waste.

2.3.2 Manifested Hazardous Waste Generation

The Federal program, RCRA, defines specific solid wastes as hazardous because they are either listed or exhibit a hazardous waste characteristic. These hazardous wastes are referred to as RCRA hazardous wastes. California's hazardous waste program is more stringent and broader in scope than U.S. EPA's. As a result, California regulates more wastes as hazardous than U.S. EPA. Wastes that are considered hazardous in California but not by U.S. EPA are referred to as non-RCRA hazardous wastes.

[31] Cal. Code Regs., tit. 22, § 66261.3

Cal. Code Regs., tit. 22, § 66260.10 defines a Hazardous Waste Generator as "any person, by site, whose act or process produces hazardous waste … or whose act first causes a hazardous waste to become subject to regulation." California issues EPA or state identification numbers to both a facility's location and owner.[32] Since 2010, more than 500,000 generators have shipped manifested hazardous waste in California.[33] A map of all the hazardous waste generators that shipped manifested hazardous waste in 2021 is shown in Figure 2.3-1. The number of generators in California appears to have almost doubled from 2010 to 2021, from approximately 55,000 to approximately 94,500[34]. This trend can be seen in Figure 2.3-2.

[32] This Report utilizes distinct EPA IDs located on manifests that were included in HWTS. The number of generators may be an overestimation because numbers are issued to either a location or an owner. This results in double counting of some facilities. The extent of the overestimation is not available for this report.
[33] Future analysis to include industry classification information like that from the North American Industry Classification System.
[34] Reflects number of generators based on unique EPA ID numbers as included in HWTS. This value does not include the number of generators based on unique EPA ID numbers as included in the California Environmental Reporting System which may be different. It also does not include additional generators that would be found in the Transporter Quarterly Report.

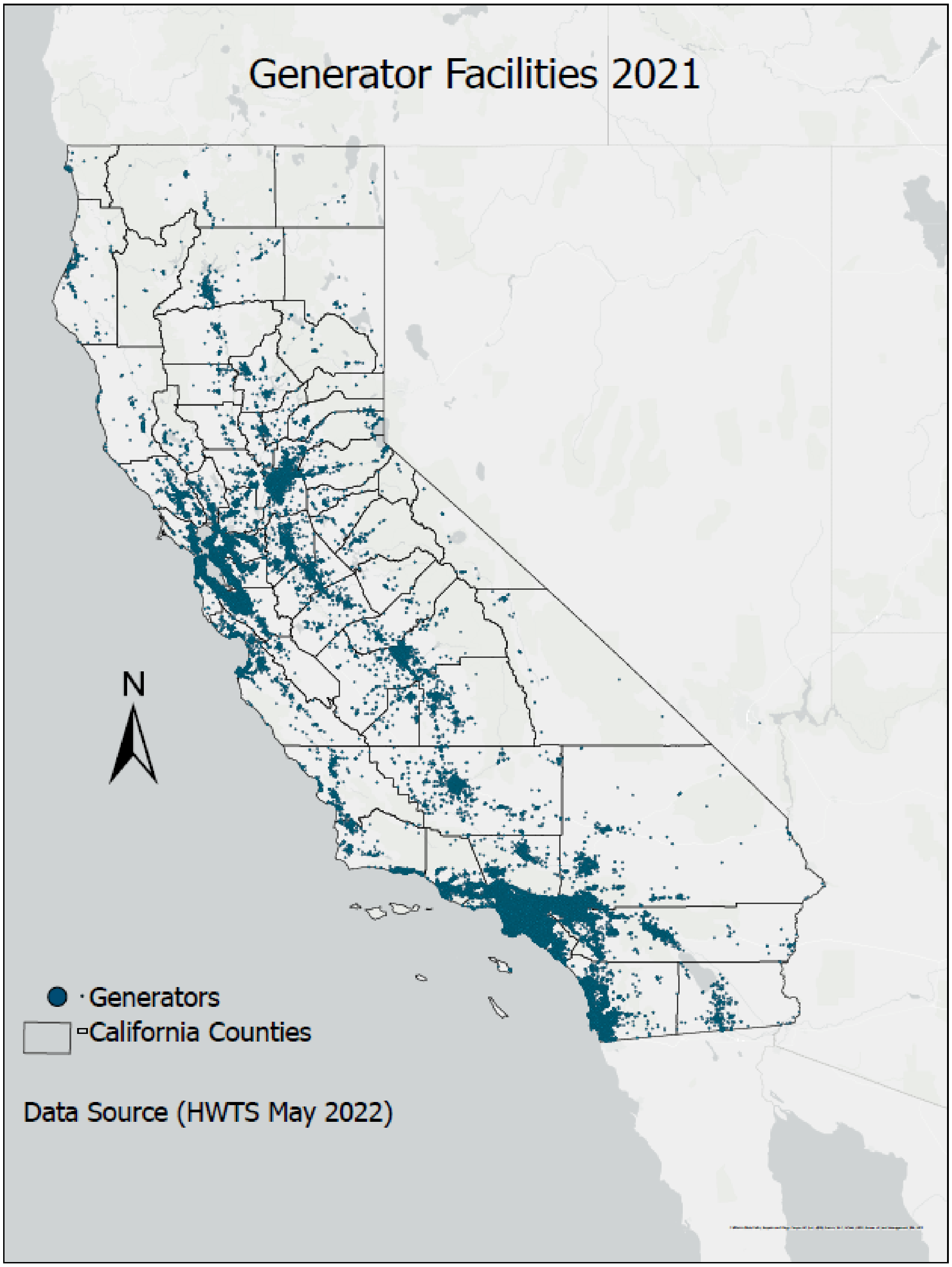


Figure 2.3-1:California's 2021 Generators, January to December 2021

Note: Data sourced from Hazardous Waste Tracking System and accessed in May 2022.

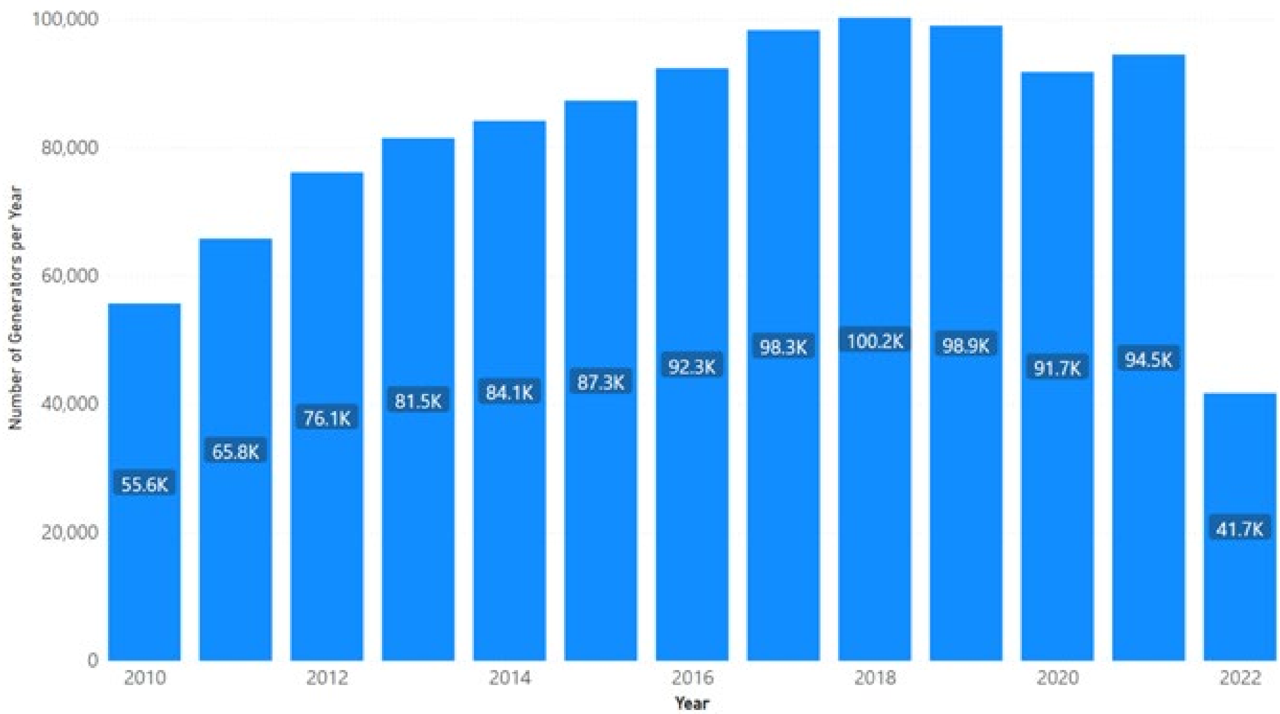


Figure 2.3-2: Hazardous Waste Generators per Year

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

Hazardous waste generators are not spread equally throughout California. Counties with larger populations generally have more hazardous waste generators than smaller, less populated counties. Los Angeles County has the most hazardous waste generators by far, with almost 23,000. Figure 2.3-3 shows the number of hazardous waste generators per county in 2021.

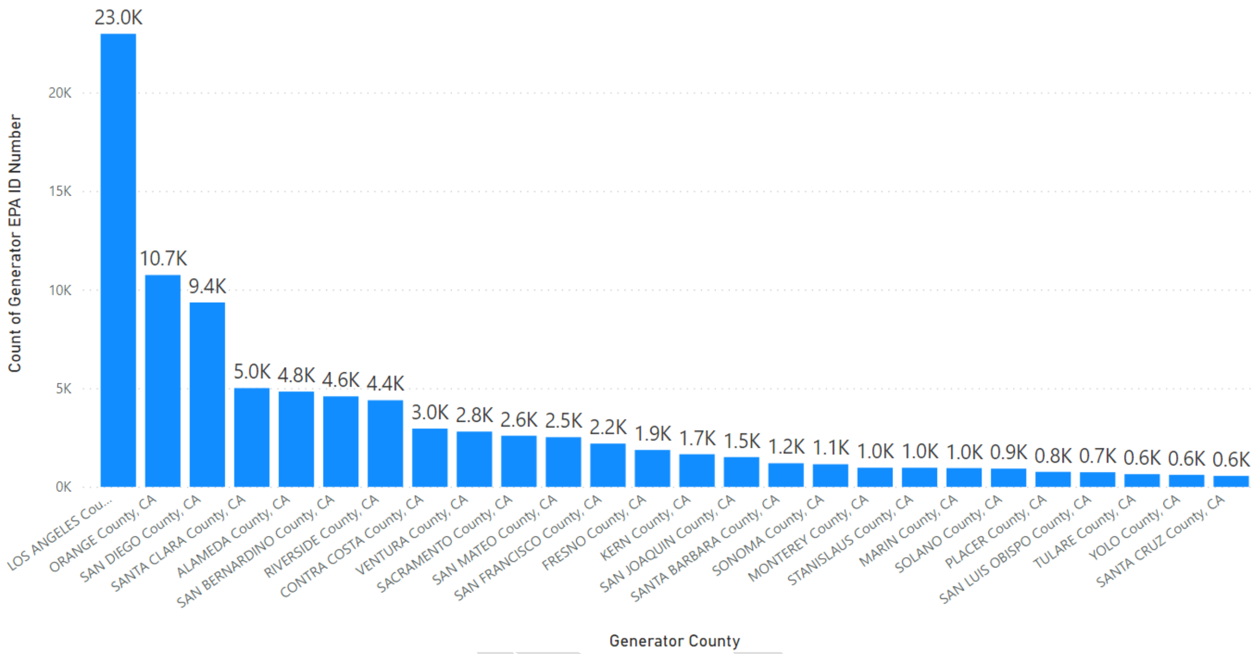


Figure 2.3-3: Hazardous Waste Generators per County, 2021

Note: Data is for all counties that had more than 500 generators in 2021.
Data sourced from Hazardous Waste Tracking System and accessed in May 2022.

Since 2010, California generators have generated 21.0 million tons of manifested hazardous waste. Annual quantities have ranged from approximately 1.41 million tons to 1.98 million tons. Preliminary review of generation trends prior to 2010 indicates a decreasing trend in overall generation since 2000. This aligns with the trends seen in overall hazardous waste generation from the Community Protection and Hazardous Waste Reduction Initiative.[35] Figure 2.3-4 shows California's manifested hazardous waste generation annually since January 2010.

[35] A detailed analysis of data from 2000 to 2010 has not been completed. The HWPlan unit is working to fully incorporate additional data into the data set for analysis. The prior Community Protection Hazardous Waste Reduction Initiative quantified overall generation from 1995 through 2015 and showed a decrease in the total quantity of hazardous waste generated during that time period.

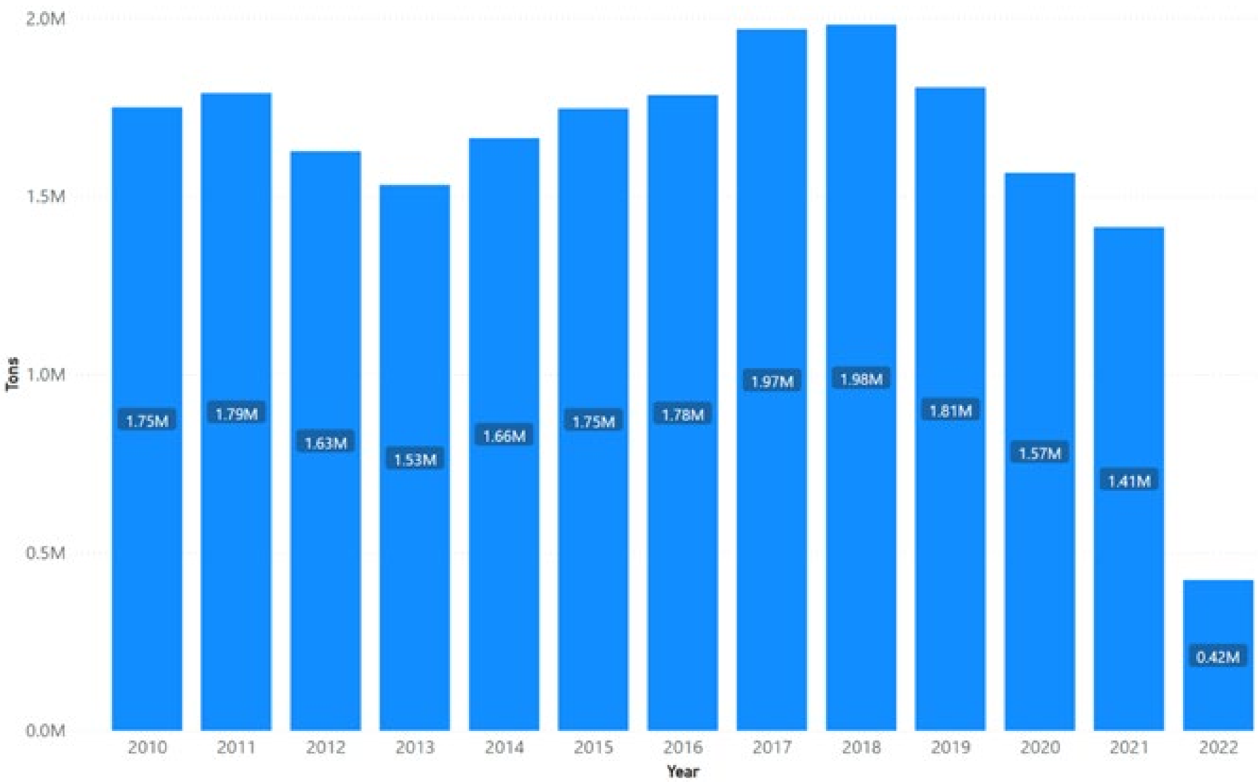


Figure 2.3-4: Annual Manifested Hazardous Waste Generation (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

2.3.3 RCRA and non-RCRA Hazardous Waste

Under Subtitle C of RCRA, U.S. EPA defines hazardous waste using two mechanisms: by listing certain wastes as hazardous (Listed Hazardous Wastes), and by identifying the properties or characteristics that make a waste hazardous (Characteristic Hazardous Wastes).[36]

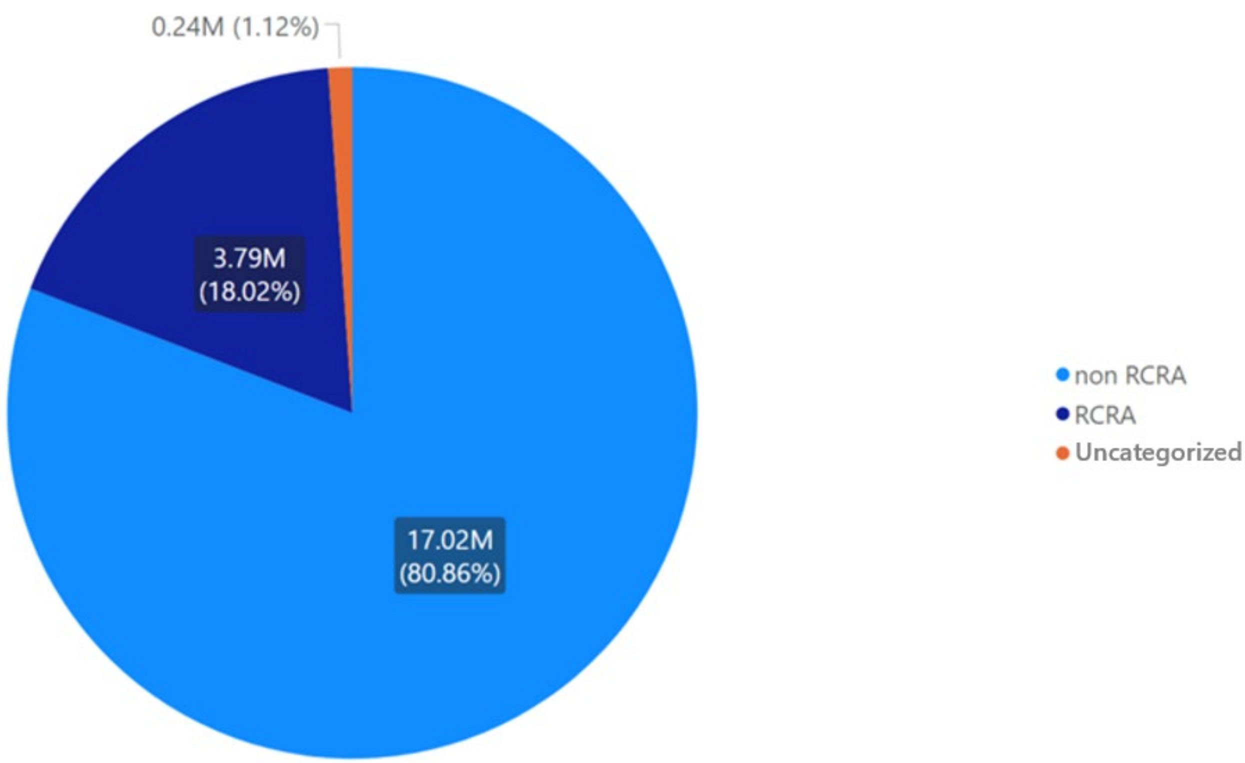
California's hazardous waste criteria are more stringent and broader in scope, which results in California identifying more wastes as hazardous than does RCRA. As such, California's manifested hazardous waste is organized into two categories: "RCRA hazardous waste" and "non-RCRA hazardous waste." In this Report, RCRA hazardous wastes are those identified as hazardous by RCRA, and non-RCRA hazardous wastes are the additional wastes considered hazardous in California but not by RCRA.

[36] 45 FR 33085 (May 19, 1980)

RCRA and non-RCRA hazardous wastes are identified by specific waste codes. Waste codes must be included on uniform hazardous waste manifests. This allows each type of waste to be quantified.

RCRA and non-RCRA waste codes are included in Cal. Code Regs., tit. 22. div. 4.5, chapter 11. For the purposes of this Report, waste codes have been organized as "waste streams."[37]

Since 2010, California generators have generated 17.0 million tons of non-RCRA manifested hazardous waste and 3.79 million tons of RCRA manifested hazardous waste, as shown in Figure 2.3-5. The 17.0 million tons of non-RCRA waste represents more than 80 percent of manifested hazardous waste generated during this time period. This is a result of California's hazardous waste criteria management being broader in scope and more stringent than RCRA.



[37] Utilizing waste codes as "waste streams" organizes waste generation data at its most basic level. Waste streams can be grouped together based on many considerations, such as industry type, waste source, or similarity, such as metals or organics. Organizing waste streams based on waste codes was determined to be the most appropriate method for this Report, because other organization schemes are typically created with a specific goal in mind, such as reducing waste generation from specific industries. Since this Report is establishing a quantitative baseline, the organizational method chosen can be expanded upon in future research based on specific questions or research topics.

Figure 2.3-5: Amount of RCRA and Non-RCRA Manifested Hazardous Waste (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

2.3.3.1 RCRA Manifested Hazardous Waste

Since 2010, generation of RCRA manifested hazardous waste averaged 309,980 tons per year and ranged between 224,600 and 398,600 tons per year (Figure 2.3-6). There appears to be a slightly decreasing trend in RCRA waste generation since 2010.This appears to be consistent with trends seen in preliminary review of the years prior to 2010.[38] Reductions in generation seen during 2020 and 2021 are likely due, in part, to the COVID-19 pandemic.

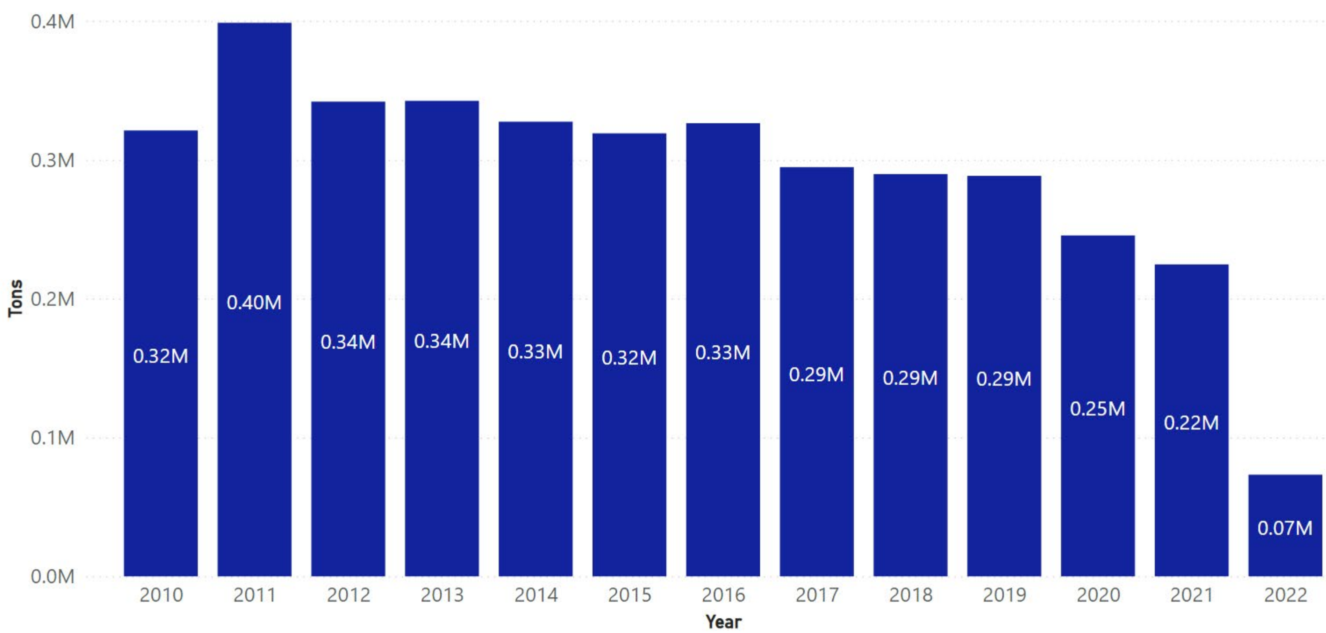


Figure 2.3-6: Annual Amount of RCRA Manifested Hazardous Waste (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

[38] A detailed analysis of data from 2000 to 2010 has not been completed. The HWPlan unit is working to fully incorporate additional data into the data set for analysis. The prior Community Protection Hazardous Waste Reduction Initiative did not organize the waste based on RCRA or non-RCRA classification so prior analysis is not available.

For more information on California's RCRA hazardous waste, please see Section 3.1.5 Amount of Hazardous Waste Regulated under the Federal Act.

2.3.3.2 Non-RCRA Manifested Hazardous Waste

Generation of non-RCRA manifested hazardous waste averaged 1,389,775 tons per year and ranged between 1,091,240 and 1,680,348 tons per year (Figure 2.3-7). Generation of non-RCRA waste has fluctuated since 2010 and preliminary review of the years prior to 2010 shows a decreasing trend since 2000.[39] Reductions in generation seen during 2020 and 2021 are likely due, in part, to the COVID-19 pandemic.

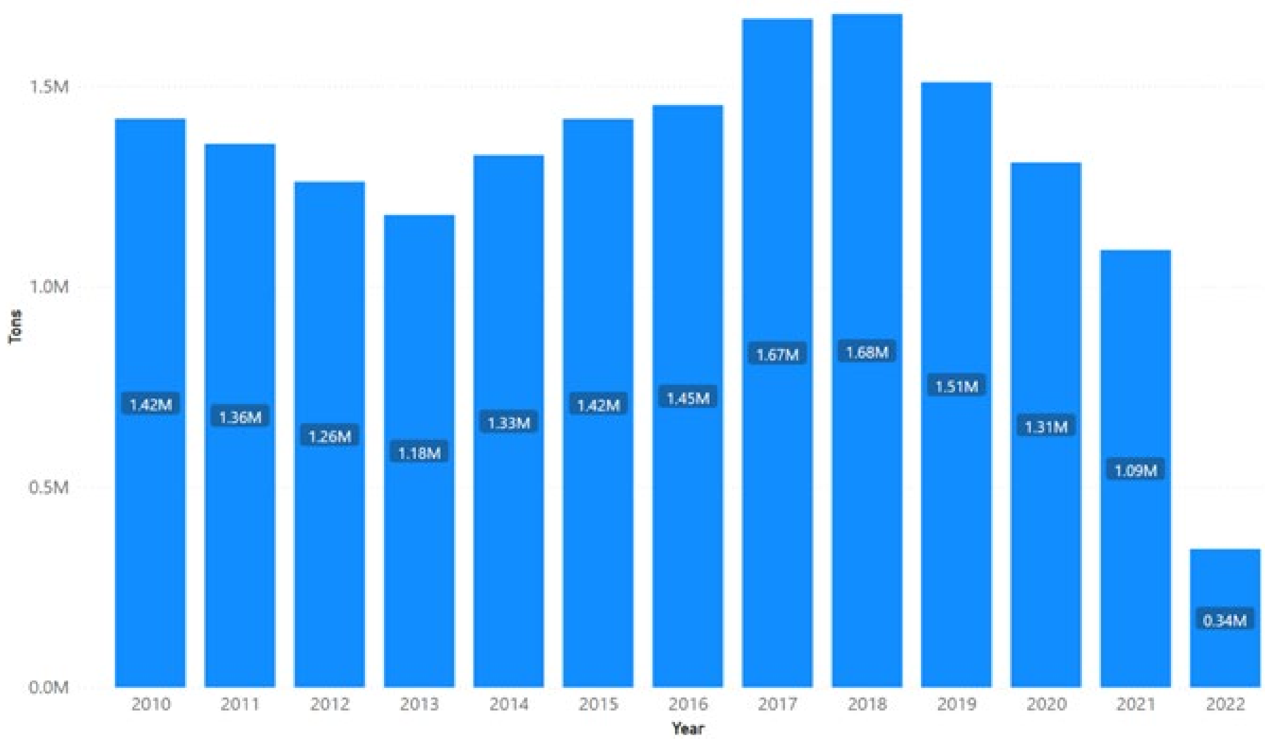


Figure 2.3-7: Amount of California's Non-RCRA Manifested Hazardous Waste per Year

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

For more information on California's RCRA hazardous waste, please see Section 3.1.6 Amount of Hazardous Waste Regulated only in the State.

[39] A detailed analysis of data from 2000 to 2010 has not been completed. The HWPlan unit is working to fully incorporate additional data into the data set for analysis. The prior Community Protection Hazardous Waste Reduction Initiative did not organize the waste based on RCRA or non-RCRA classification so prior analysis is not available.

2.3.4 California's Largest Hazardous Waste Streams

Three waste streams have consistently been the largest since 2010. The largest waste stream generated in California each year is Contaminated Soil from Site Cleanups (State Waste Code 611). The second largest hazardous waste stream is Waste Oil and Mixed Oil (State Waste Code 221). The third largest hazardous waste stream is Other Inorganic Solid Waste (State Waste Code 181). Since 2010, these three waste streams have accounted for 13,651,300 tons, or 64.8 percent of all hazardous waste generated in California.

This can be seen in Figure 2.3-8, which shows how much waste has been generated from these three waste streams, as compared to all other manifested waste in California.

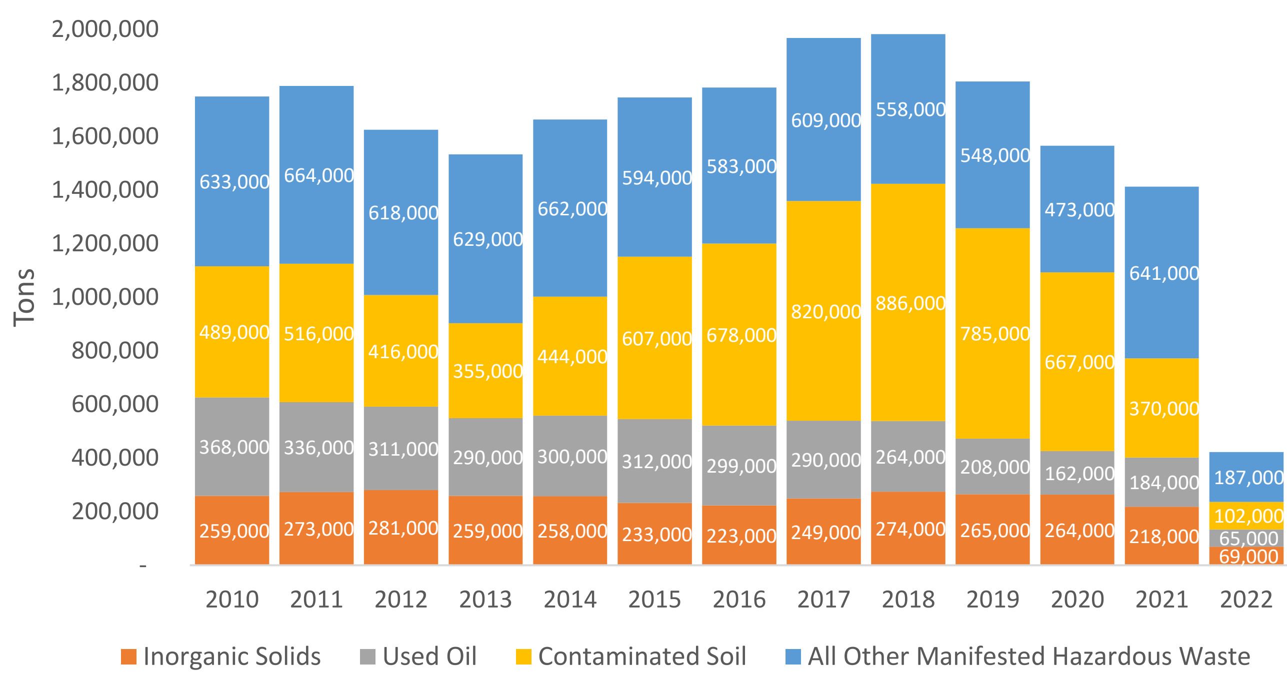


Figure 2.3-8: Largest Waste Streams in Tons per Year

Two of these waste streams – Contaminated Soil from Site Cleanups and Other Inorganic Solid Waste – are considered "non-recurring" waste streams. This means they are dependent on specific projects that will change year to year. In other words, the waste is not generated from a recurring process, such as a manufacturing plant producing a product. In contrast, Waste Oil and Mixed Oil are "recurring" waste streams. Recurring waste streams are generated by recurring processes that generate relatively consistent quantities each year. In other words, there are not large variations in volume generated year-to-year and they are not dependent on specific projects.

2.3.4.1 Contaminated Soil from Site Cleanups

California generators have generated more Contaminated Soil from Site Cleanups (State Waste Code 611) than any other waste stream since 2010. While the waste code title is Contaminated Soil from Site Cleanups, the waste code is also used to indicate contaminated soil generated from other sources like general construction activities. On average, more than 567,000 tons are manifested each year,[41] which represents nearly a quarter to half of the manifested hazardous waste generated annually. Figure 2.3-9 shows the quantity of contaminated soil generated each year in California.

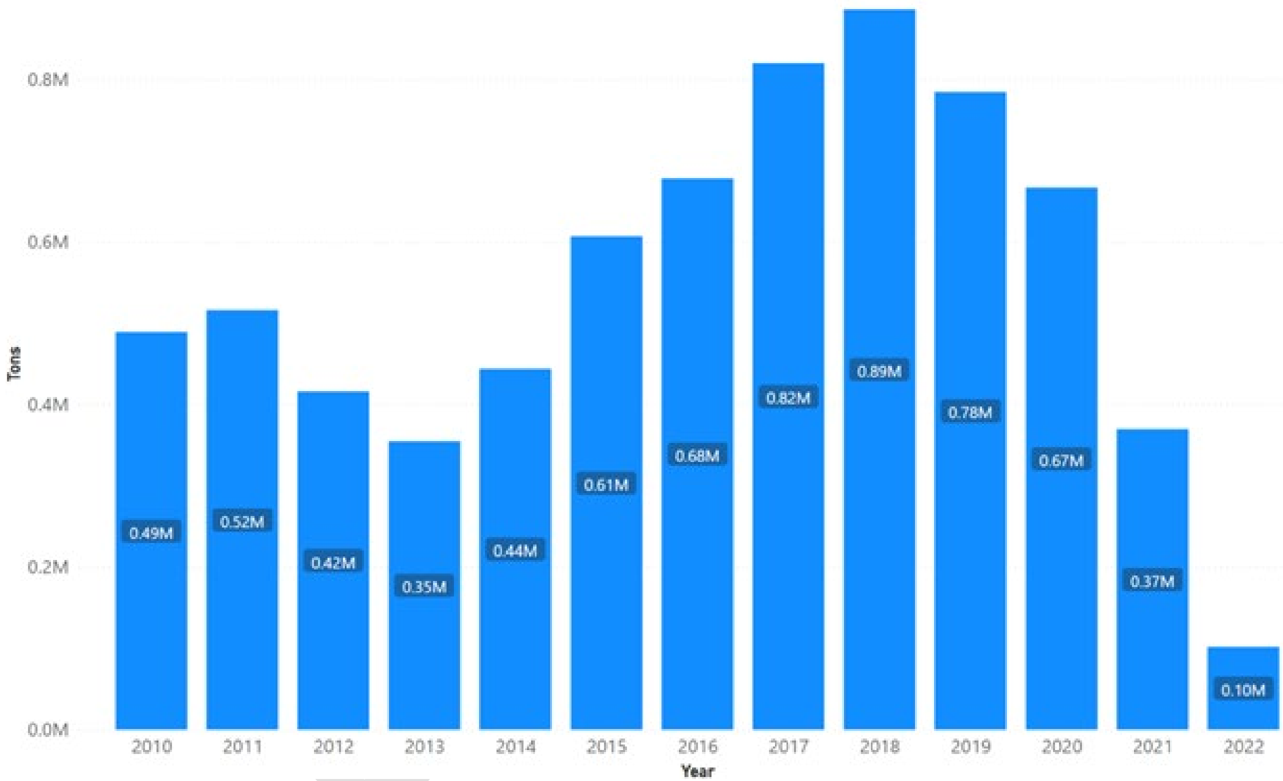


Figure 2.3-9: Quantity of Contaminated Soil Generated in California

About 93 percent of the contaminated soil generated since 2010 has been non-RCRA hazardous waste (Figure 2.3-10).

[41] Mean: 567,300 Tons, Standard Deviation: 179,100 Tons

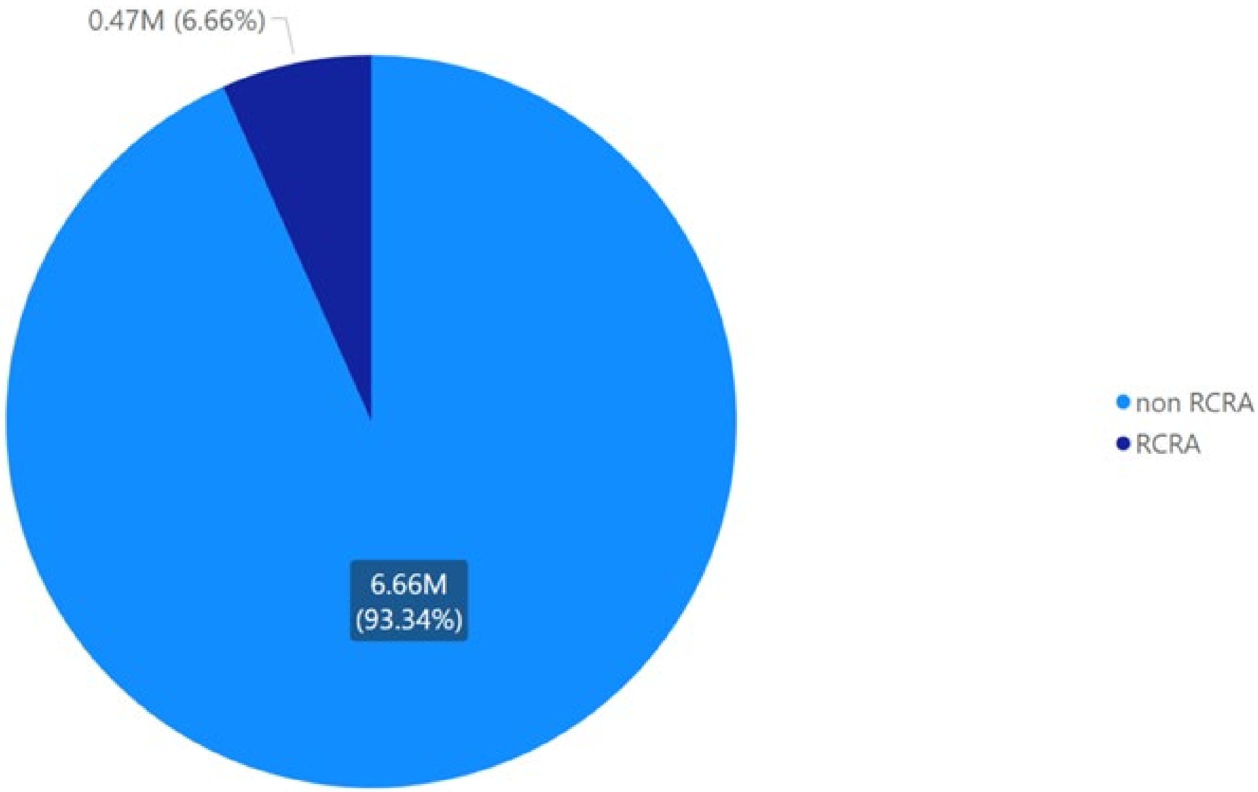


Figure 2.3-10: Amount of RCRA and Non-RCRA Contaminated Soil Generated in California

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

As discussed previously, waste codes designate the type of waste listed on a manifest, but non-RCRA waste codes do not identify the type of contaminant that causes a soil to be identified as hazardous waste. To determine specific contaminants involved and their concentrations, DTSC must contact individual generators. DTSC contacted the five generators that produced the most contaminated soil in 2021, and three of the five have provided data that is under review. Preliminary findings reveal that the constituent that caused the overwhelming majority of soil to be identified as hazardous was lead that failed California's Waste Extraction Test (WET). Other metals such as copper and zinc were also identified. These early observations also appear to show that concentrations of lead in the WET results are low and relatively close to the lead Solubility Threshold Limit Concentration (STLC) of 5 mg/L. Additional research in this area should be completed to ensure that the current management requirements for this waste stream are appropriate, given the mobility characteristics of these primary constituents, as well as the design of modern waste disposal facilities. Figure 2.3-11 shows the largest generators of contaminated soil in 2021.

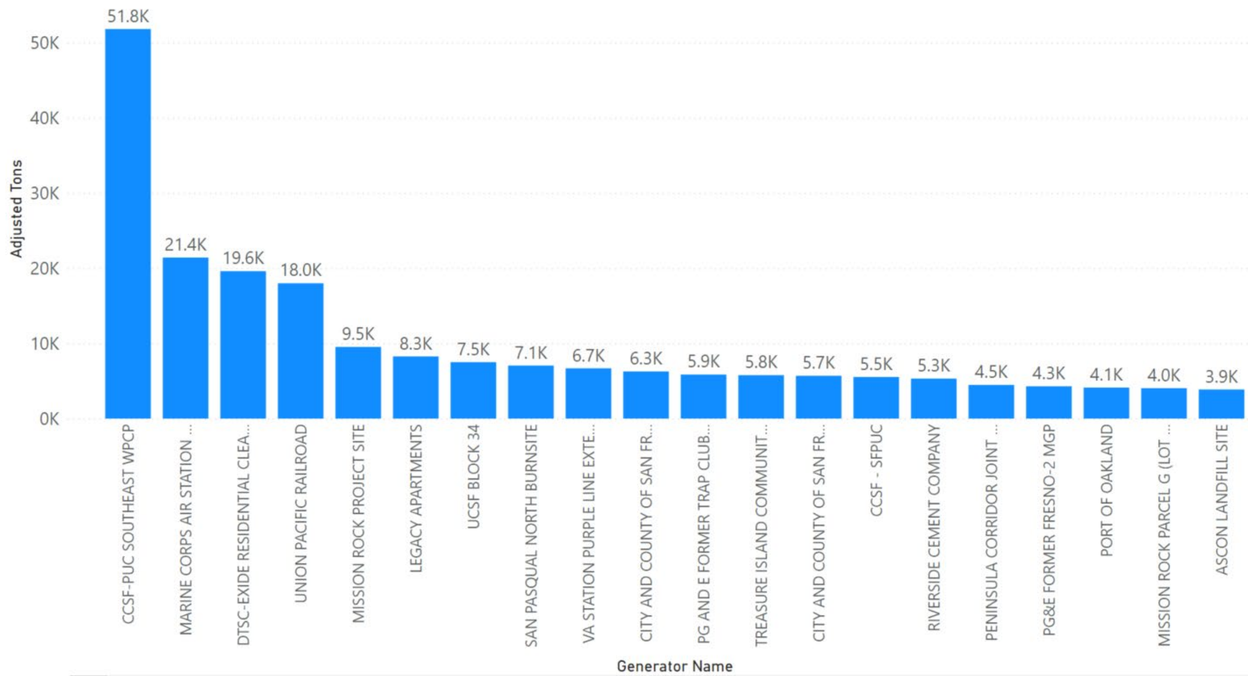


Figure 2.3-11: California's Largest Twenty Contaminated Soil Generators in 2021

The quantity of contaminated soil may increase over the next several years, as funding has recently increased for both state cleanups and federal infrastructure projects.[43] In addition, large remediation projects, such as the Santa Susana Field Laboratory (SSFL), are anticipated over the next fifteen years. These projects are expected to generate large quantities of contaminated soil.[45] As in previous years, a large percentage of this contaminated soil will likely be considered non-RCRA hazardous.

2.3.4.2 Waste Oil and Mixed Oil

Since 2010, the second largest hazardous waste stream generated in California has been Waste Oil and Mixed Oil (State Waste Code 221), an average of more than 323,000 tons[46] each year.

[43] Through the passage of SB158, Governor Gavin Newsom and the State Legislature set aside $500 million for Cleanup in Vulnerable Communities which may generate contaminated soil if excavation is a chosen remedy. The Infrastructure Investment and Jobs Act passed by the United States Congress will provide funding for infrastructure projects. Infrastructure projects such as roads and bridges typically require excavation. Excavated soil must be characterized to ensure proper management. California has more stringent waste criteria than RCRA. This is likely to result in a large quantity of soil that will require management as hazardous waste.

[45] The 2023 SSFL PEIR estimates approximately 816,000 cubic yards (1,224,000 tons) of soil to be excavated will be hazardous. The project is anticipated to be conducted over the next 15 years.

[46] Mean: 323,471, SD: 64,758

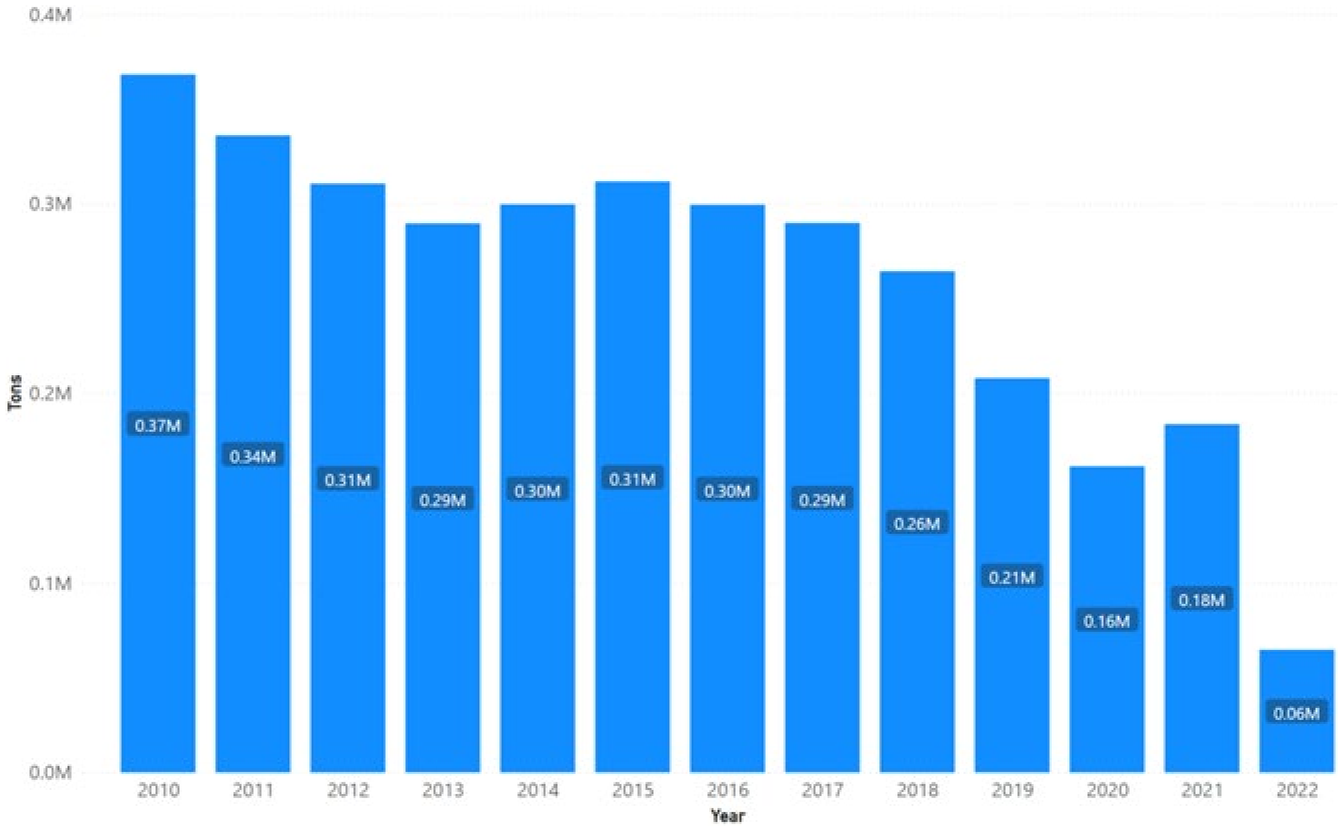


Figure 2.3-12: Amount of RCRA and Non-RCRA Waste Oil Generated in California

About 99.6 percent of waste oils are managed as non-RCRA hazardous waste (Figure 2.3-13). Waste Oils and Mixed Oils are generated from various sources, such as industrial operations and small auto shops.

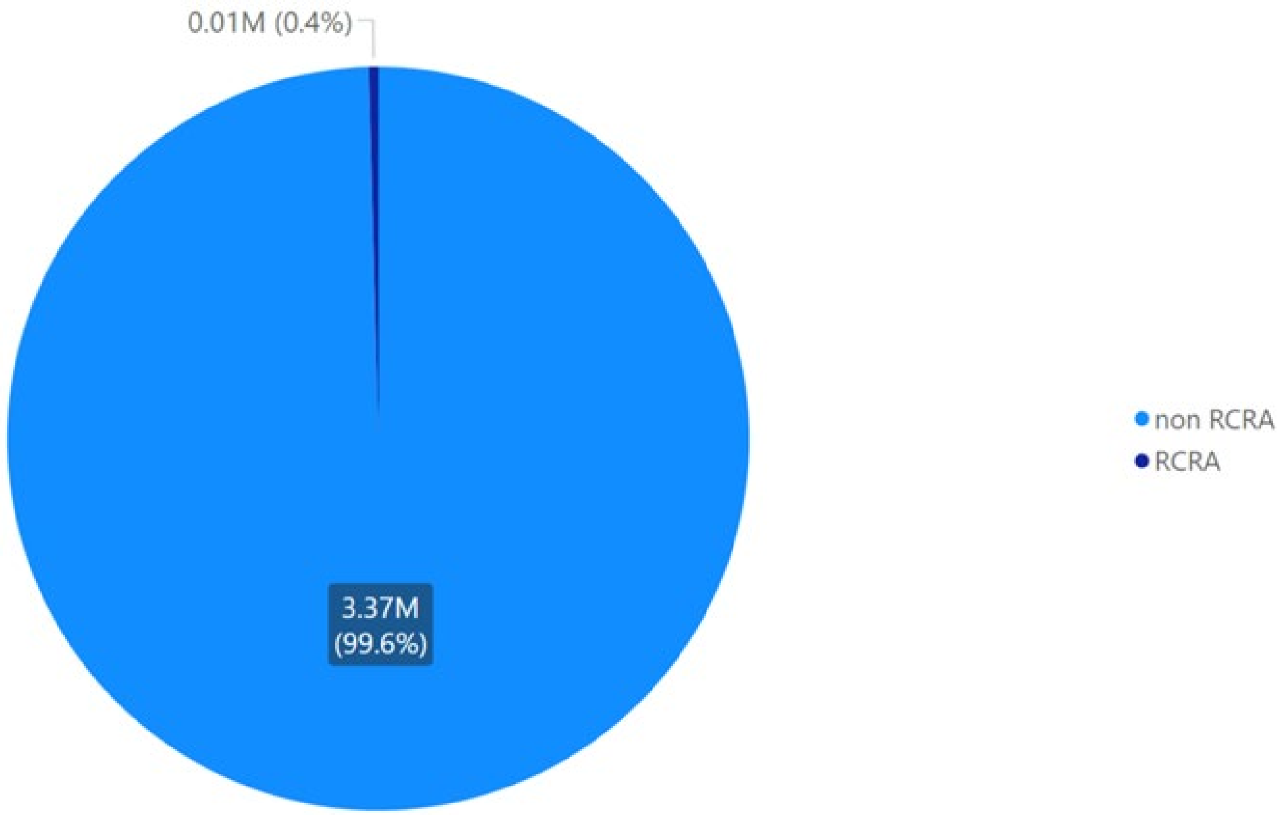


Figure 2.3-13: Amount of RCRA and Non-RCRA Waste Oil Generated in California, January 2010 - May 2022

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

Waste Oil and Mixed Oil from the consumer automotive industry will likely decrease in coming years, as a result of Governor Newsom's Executive Order N-79-20, which directs the state to require, that all new cars and passenger trucks sold in California be zero emission vehicles (ZEV) by 2035. The phasing out of internal combustion engine vehicles is expected to have a significant impact on this waste stream. However, it is currently unclear how much waste oil is generated specifically from consumer automobiles.

California's transition to zero emission vehicles will also result in new waste streams the state will need to manage. One such stream may come from lithium extraction projects near the Salton Sea.[47] Once lithium is extracted, it may need to be further refined before

[47] https://www.gov.ca.gov/2023/03/20/governor-newsom-visits-lithium-valley-to-highlight-momentum-on-becoming-global-source-for-battery-production/

it can be used as the electrolyte within ZEV batteries. This processing and refining may result in the generation of additional hazardous wastes.

Lithium batteries have a limited life span. While they can be reused in other energy storage applications after being replaced in ZEVs, they eventually need to be disposed of and will likely become hazardous waste that must be managed appropriately.

For future hazardous waste management planning, DTSC should review and analyze reduction and management methods for these batteries. The waste management hierarchy of source reduction, recycling, treatment, and disposal will be used to waste management approach. Batteries will be sent out of state for recycling if there is no recycling capacity in state. To encourage a circular economy for these wastes and maintain health and environmental protections, DTSC should further examine challenges and opportunities around this issue in the Plan.

2.3.4.3 Other Inorganic Solid Waste

Since 2010, California's third largest hazardous waste stream has been Other Inorganic Solid Waste (State Waste Code 181). On average, California manifests more than 264,000 tons[49] of other inorganic solids each year (Figure 2.3-14).

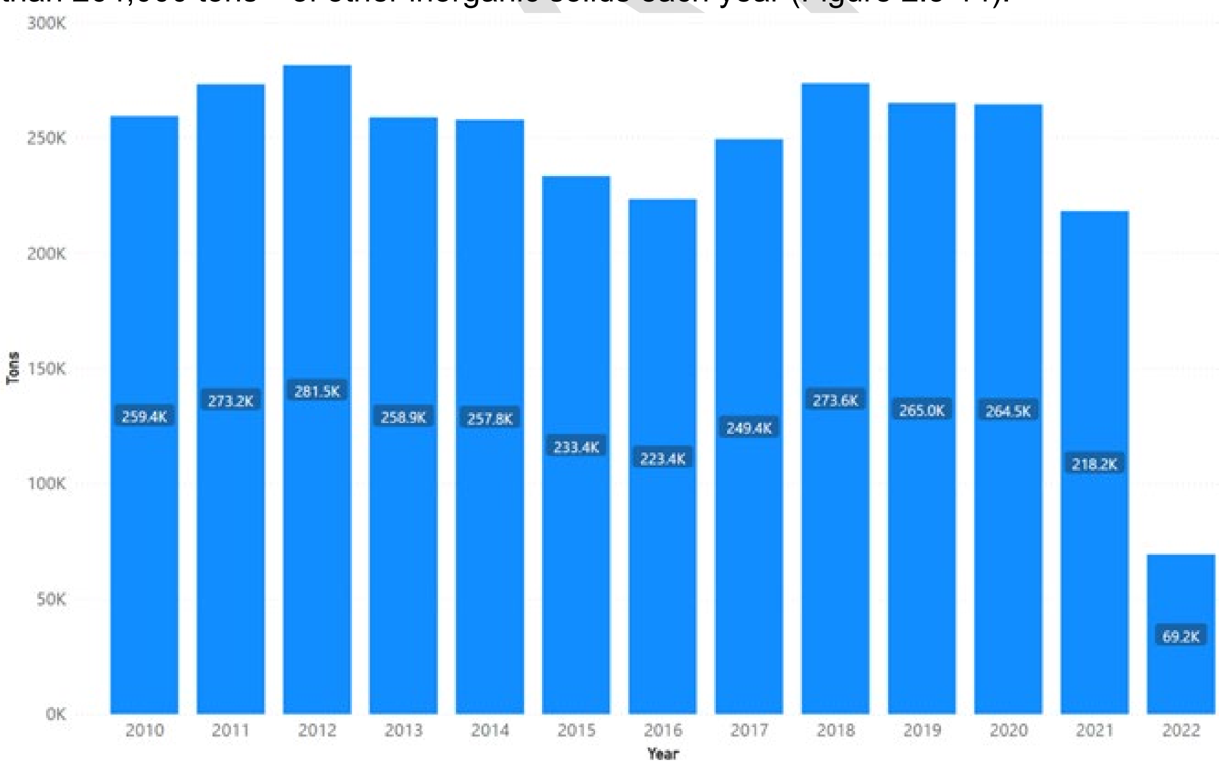


Figure 2.3-14: Amount of Other Inorganic Solid Waste Generated in California (RCRA and Non-RCRA combined)

[49] Mean: 264,700 Tons, SD: 18,100 Tons

Other Inorganic Solid Waste is typically produced during projects like demolitions or cleanups that also produce contaminated soil. Excavation can unearth contaminated construction debris and other items along with soil. In these cases, the manifest code for Other Inorganic Solid Waste may be used. Other Inorganic Solid Waste can also be produced during other waste generating activities as well. About 68.6 percent of Other Inorganic Solid Waste is non-RCRA Hazardous Waste.

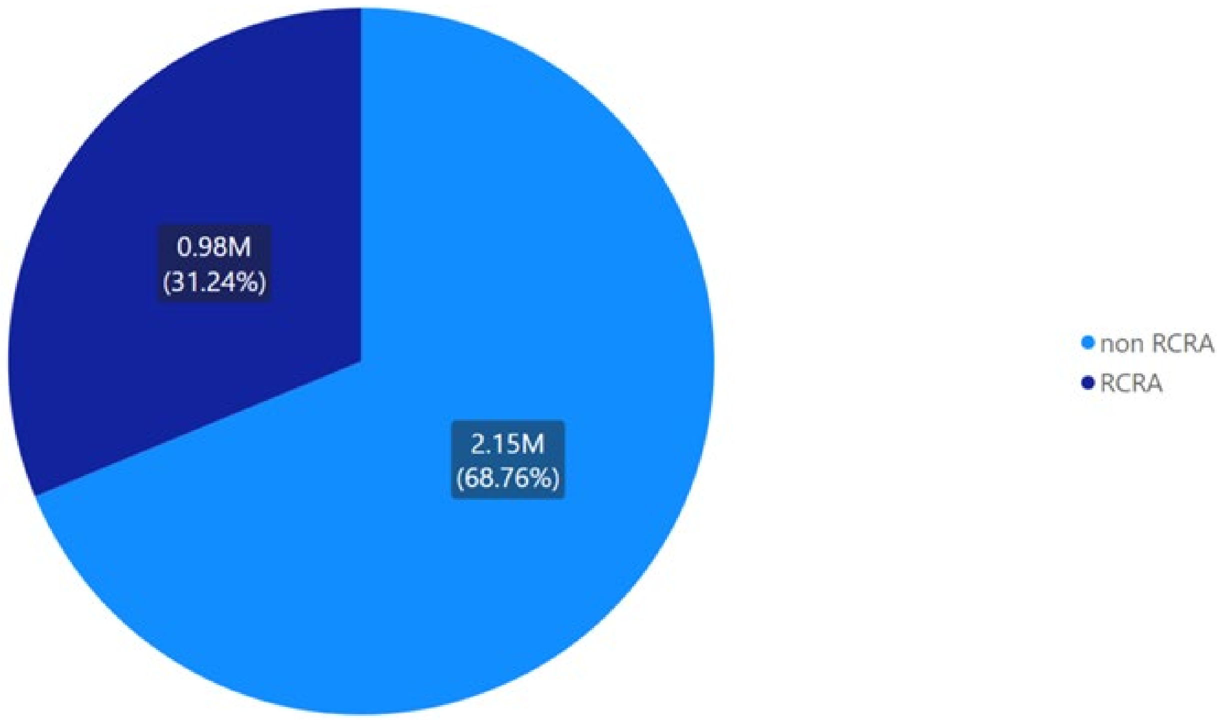


Figure 2.3-15 Amount of RCRA and Non-RCRA Other Inorganic Solid Waste Generated in California

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

2.3.5 County in which each Hazardous Waste Stream is Generated

In accordance with HSC § 25135(b)(1)(A), the quantity of waste generated within each of the 58 counties in California is included below. This section includes the following information for each county:

- The number of generators
- The amount of manifested hazardous waste generated since 2010
    - The amount of non-RCRA manifested hazardous waste
    - The amount of RCRA manifested hazardous waste
    - The amount of uncategorized manifested hazardous waste

Appendix A includes each county’s annual tonnage for each hazardous waste code reported.

2.3.5.1 Alameda County, CA

Since 2010, 29,795 generators have produced 1,393,000 tons of hazardous waste in Alameda County. This includes 1,168,400 tons of non-RCRA manifested hazardous waste, 217,400 tons of RCRA manifested hazardous waste, and 7,300 tons of uncategorized manifested hazardous waste.

2.3.5.2 Alpine County, CA

Since 2010, 47 generators have generated 13,700 tons of hazardous waste in Alpine County. This includes 13,500 tons of non-RCRA manifested hazardous waste, 140 tons of RCRA manifested hazardous waste, and 60 tons of uncategorized manifested hazardous waste.

2.3.5.3 Amador County, CA

Since 2010, 340 generators have generated 7,200 tons of hazardous waste in Amador County. This includes 6,300 tons of non-RCRA manifested hazardous waste, 900 tons of RCRA manifested hazardous waste, and 50 tons of uncategorized manifested hazardous waste.

2.3.5.4 Butte County, CA

Since 2010, 2003 generators have generated 99,800 tons of hazardous waste in Butte County. This includes 97,000 tons of non-RCRA manifested hazardous waste, 2,800 tons of RCRA manifested hazardous waste, and 800 tons of uncategorized manifested hazardous waste.

2.3.5.5 Calaveras County, CA

Since 2010, 292 generators have generated 2,200 tons of hazardous waste in Calaveras County. This includes 1,200 tons of non-RCRA manifested hazardous waste, 1,000 tons of RCRA manifested hazardous waste, and 2 tons of uncategorized manifested hazardous waste.

2.3.5.61 Colusa County, CA

Since 2010, 243 generators have generated 4,100 tons of hazardous waste in Colusa County. This includes 3,800 tons of non-RCRA manifested hazardous waste, 300 tons of RCRA manifested hazardous waste, and 40 tons of uncategorized manifested hazardous waste.

2.3.5.7 Contra Costa County, CA

Since 2010, 20,423 generators have generated 934,000 tons of hazardous waste. This includes 745,700 tons of non-RCRA manifested hazardous waste, 182,500 tons of RCRA manifested hazardous waste, and 5,400 tons of uncategorized manifested hazardous waste.

2.3.5.8 Del Norte County, CA

Since 2010, 143 generators have produced 500 tons of hazardous waste in Del Norte County. This includes 400 tons of non-RCRA manifested hazardous waste, 60 tons of RCRA manifested hazardous waste, and 5 tons of uncategorized manifested hazardous waste.

2.3.5.9 El Dorado County, CA

Since 2010, 1,424 generators have generated 7,300 tons of hazardous waste in El Dorado County. This includes 6,100 tons of non-RCRA manifested hazardous waste, 1,000 tons of RCRA manifested hazardous waste, and 150 tons of uncategorized manifested hazardous waste.

2.3.5.10 Fresno County, CA

Since 2010, 9,595 generators have generated 519,600 tons of hazardous waste in Fresno County. This includes 449,800 tons of non-RCRA manifested hazardous waste, 65,400 tons of RCRA manifested hazardous waste, and 4,200 tons of uncategorized manifested hazardous waste.

2.3.5.11 Glenn County, CA

Since 2010, 400 generators have generated 8,200 tons of hazardous waste in Glenn County. This includes 4,300 tons of non-RCRA manifested hazardous waste, 3,800 tons of RCRA manifested hazardous waste, and 40 tons of uncategorized manifested hazardous waste.

2.3.5.12 Humboldt County, CA

Since 2010, 1,175 generators have generated 89,500 tons of hazardous waste in Humboldt County. This includes 84,100 tons of non-RCRA manifested hazardous waste, 2,400 tons of RCRA manifested hazardous waste, and 3,000 tons of uncategorized manifested hazardous waste.

2.3.5.13 Imperial County, CA

Since 2010, 1,662 generators have generated 481,300 tons of hazardous waste. This includes 416,300 tons of non-RCRA manifested hazardous waste, 25,000 tons of RCRA manifested hazardous waste, and 40,000 tons of uncategorized manifested hazardous waste.

2.3.5.14 Inyo County, CA

Since 2010, 213 generators have generated 38,200 tons of hazardous waste in Inyo County. This includes 29,400 tons of non-RCRA manifested hazardous waste, 8,700 tons of RCRA manifested hazardous waste, and 20 tons of uncategorized manifested hazardous waste.

2.3.5.15 Kern County, CA

Since 2010, 6,607 generators have generated 787,400 tons of hazardous waste in Kern County. This includes 702,000 tons of non-RCRA manifested hazardous waste, 79,300 tons of RCRA manifested hazardous waste, and 6,100 tons of uncategorized manifested hazardous waste.

2.3.5.16 Kings County, CA

Since 2010, 1,053 generators have generated 29,900 tons of hazardous waste in Kings County. This includes 21,400 tons of non-RCRA manifested hazardous waste, 8,000 tons of RCRA manifested hazardous waste, and 500 tons of uncategorized manifested hazardous waste.

2.3.5.17 Lake County, CA

Since 2010, 481 generators have generated 34,700 tons of hazardous waste in Lake County. This includes 33,600 tons of non-RCRA manifested hazardous waste, 500 tons of RCRA manifested hazardous waste, and 600 tons of uncategorized manifested hazardous waste.

2.3.5.18 Lassen County, CA

Since 2010, 273 generators have generated 9,500 tons of hazardous waste in Lassen County. This includes 6,700 tons of non-RCRA manifested hazardous waste, 2,700 tons of RCRA manifested hazardous waste, and 60 tons of uncategorized manifested hazardous waste.

2.3.5.19 Los Angeles County, CA

Since 2010, 148,730 generators have generated 6,588,500 tons of hazardous waste in Los Angeles County. This includes 5,035,900 tons of non-RCRA manifested hazardous waste, 1,496,400 tons of RCRA manifested hazardous waste, and 56,300 tons of uncategorized manifested hazardous waste.

2.3.5.20 Madera County, CA

Since 2010, 1,031 generators have generated 22,800 tons of hazardous waste in Madera County. This includes 7,300 tons of non-RCRA manifested hazardous waste, 14,300 tons of RCRA manifested hazardous waste, and 1,300 tons of uncategorized manifested hazardous waste.

2.3.5.21 Marin County, CA

Since 2010, 6,666 generators have generated 86,600 tons of hazardous waste in Marin County. This includes 75,500 tons of non-RCRA manifested hazardous waste, 10,300 tons of RCRA manifested hazardous waste, and 800 tons of uncategorized manifested hazardous waste.

2.3.5.22 Mariposa County, CA

Since 2010, 127 generators have generated 700 tons of hazardous waste in Mariposa County. This includes 600 tons of non-RCRA manifested hazardous waste, 80 tons of RCRA manifested hazardous waste, and 0.1 tons of uncategorized manifested hazardous waste.

2.3.5.23 Mendocino County, CA

Since 2010, 872 generators have generated 11,300 tons of hazardous waste in Mendocino County. This includes 5,800 tons of non-RCRA manifested hazardous waste, 5,500 tons of RCRA manifested hazardous waste, and 40 tons of uncategorized manifested hazardous waste.

2.3.5.24 Merced County, CA

Since 2010, 1,901 generators have generated 16,400 tons of hazardous waste in Merced County. This includes 13,600 tons of non-RCRA manifested hazardous waste, 2,300 tons of RCRA manifested hazardous waste, and 400 tons of uncategorized manifested hazardous waste.

2.3.5.25 Modoc County, CA

Since 2010, 55 generators have generated 125 tons of hazardous waste in Modoc County. This included 123 tons of non-RCRA manifested hazardous waste, 2 tons of RCRA manifested hazardous waste, and 0.3 tons of uncategorized manifested hazardous waste.

2.3.5.26 Mono County, CA

Since 2010, 97 generators have generated 2,200 tons of hazardous waste in Mono County. This includes 2,000 tons of non-RCRA manifested hazardous waste, 200 tons of RCRA manifested hazardous waste, and 50 tons of uncategorized manifested hazardous waste.

2.3.5.27 Monterey County, CA

Since 2010, 5,141 generators have generated 99,000 tons of hazardous waste in Monterey County. This includes 87,000 tons of non-RCRA manifested hazardous waste, 10,100 tons of RCRA manifested hazardous waste, and 1,800 tons of uncategorized manifested hazardous waste.

2.3.5.28 Napa County, CA

Since 2010, 1,727 generators have generated 20,300 tons of hazardous waste in Napa County. This includes 17,500 tons of non-RCRA manifested hazardous waste, 2,700 tons of RCRA manifested hazardous waste, and 200 tons of uncategorized manifested hazardous waste.

2.3.5.29 Nevada County, CA

Since 2010, 890 generators have generated 10,800 tons of hazardous waste in Nevada County. This includes 7,900 tons of non-RCRA manifested hazardous waste, 1,800 tons of RCRA manifested hazardous waste, and 1,200 tons of uncategorized manifested hazardous waste.

2.3.5.30 Orange County, CA

Since 2010, 68,105 generators have generated 878,500 tons of hazardous waste in Orange County. This includes 547,100 tons of non-RCRA manifested hazardous waste, 320,900 tons of RCRA manifested hazardous waste, and 10,600 tons of uncategorized manifested hazardous waste.

2.3.5.31 Placer County, CA

Since 2010, 2,852 generators have generated 51,100 tons of hazardous waste in Placer County. This includes 45,500 tons of non-RCRA manifested hazardous waste, 5,300 tons of RCRA manifested hazardous waste, and 300 tons of uncategorized manifested hazardous waste.

2.3.5.32 Plumas County, CA

Since 2010, 306 Generators have generated 5,200 tons of hazardous waste in Plumas County. This includes 5,000 tons of non-RCRA manifested hazardous waste, 200 tons of RCRA manifested hazardous waste, and 7 tons of uncategorized manifested hazardous waste.

2.3.5.33 Riverside County, CA

Since 2010, 18,247 generators have generated 247,500 tons of hazardous waste in Riverside County. This includes 159,800 tons of non-RCRA manifested hazardous waste, 82,100 tons of RCRA manifested hazardous waste, and 5,500 tons of uncategorized manifested hazardous waste.

2.3.5.34 Sacramento County, CA

Since 2010, 12,188 generators have generated 557,500 tons of hazardous waste in Sacramento County. This includes 418,800 tons of non-RCRA manifested hazardous waste, 134,800 tons of RCRA manifested hazardous waste, and 3,900 tons of uncategorized manifested hazardous waste.

2.3.5.35 San Benito County, CA

Since 2010, 444 generators have generated 6,400 tons of hazardous waste in San Benito County. This includes 4,600 tons of non-RCRA manifested hazardous waste, 1,700 tons of RCRA manifested hazardous waste, and 80 tons of uncategorized manifested hazardous waste.

2.3.5.36 San Bernardino County, CA

Since 2010, 22,318 generators have generated 1,353,900 tons of hazardous waste in San Bernardino County. This includes 1,171,800 tons of non-RCRA manifested hazardous waste, 163,400 tons of RCRA manifested hazardous waste, and 18,600 tons of uncategorized manifested hazardous waste.

2.3.5.37 San Diego County, CA

Since 2010, 48,852 generators have generated 1,075,400 tons of hazardous waste in San Diego County. This includes 798,400 tons of non-RCRA manifested hazardous waste, 253,200 tons of RCRA manifested hazardous waste, and 23,800 tons of uncategorized manifested hazardous waste.

2.3.5.38 San Francisco County, CA

Since 2010, 18,119 generators have generated 2,035,400 tons of hazardous waste in San Francisco County. This includes 1,955,500 tons of non-RCRA manifested hazardous waste, 69,700 tons of RCRA manifested hazardous waste, and 10,200 tons of uncategorized manifested hazardous waste.

2.3.5.39 San Joaquin County, CA

Since 2010, 5,798 generators have generated 264,600 tons of hazardous waste in San Joaquin County. This includes 239,400 tons of non-RCRA manifested hazardous waste, 24,200 tons of RCRA manifested hazardous waste, and 1000 tons of uncategorized manifested hazardous waste.

2.3.5.40 San Luis Obispo County, CA

Since 2010, 3,220 generators have generated 120,900 tons of hazardous waste in San Luis Obispo County. This includes 93,000 tons of non-RCRA manifested hazardous waste, 19,700 tons of RCRA manifested hazardous waste, and 8,200 tons of uncategorized manifested hazardous waste.

2.3.5.41 San Mateo County, CA

Since 2010, 16,583 generators have generated 512,600 tons of hazardous waste in San Mateo County. This includes 353,800 tons of non-RCRA manifested hazardous waste, 156,500 tons of RCRA manifested hazardous waste, and 2,200 tons of uncategorized manifested hazardous waste.

2.3.5.42 Santa Barbara County, CA

Since 2010, 6,319 generators have generated 167,300 tons of hazardous waste in Santa Barbara County. This includes 133,900 tons of non-RCRA manifested hazardous waste, 32,100 tons of RCRA manifested hazardous waste, and 1,300 tons of uncategorized manifested hazardous waste.

2.3.5.43 Santa Clara County, CA

Since 2010, 32,355 generators have generated 845,000 tons of hazardous waste in Santa Clara County. This includes 595,600 tons of non-RCRA manifested hazardous waste, 244,600 tons of RCRA manifested hazardous waste, and 4,700 tons of uncategorized manifested hazardous waste.

2.3.5.44 Santa Cruz County, CA

Since 2010, 3,095 generators have generated 45,500 tons of hazardous waste in Santa Cruz County. This includes 41,400 tons of non-RCRA manifested hazardous waste, 4,000 tons of RCRA manifested hazardous waste, and 400 tons of uncategorized manifested hazardous waste.

2.3.5.45 Shasta County, CA

Since 2010, 1,814 generators have generated 23,500 tons of hazardous waste in Shasta County. This includes 16,400 tons of non-RCRA manifested hazardous waste, 6,700 tons of RCRA manifested hazardous waste, and 400 tons of uncategorized manifested hazardous waste.

2.3.5.46 Sierra County, CA

Since 2010, 38 generators have generated 720 tons of hazardous waste in Sierra County. This includes 690 tons of non-RCRA manifested hazardous waste, 10 tons of RCRA manifested hazardous waste, and 20 tons of uncategorized manifested hazardous waste.

2.3.5.47 Siskiyou County, CA

Since 2010, 398 generators have generated 5,400 tons of hazardous waste in Siskiyou County. This includes 4,200 tons of non-RCRA manifested hazardous waste, 1,200 tons of RCRA manifested hazardous waste, and 10 tons of uncategorized manifested hazardous waste.

2.3.5.48 Solano County, CA

Since 2010, 4,383 generators have generated 665,600 tons of hazardous waste in Solano County. This includes 606,300 tons of non-RCRA manifested hazardous waste, 55,300 tons of RCRA manifested hazardous waste, and 4,000 tons of uncategorized manifested hazardous waste.

2.3.5.49 Sonoma County, CA

Since 2010, 6,184 generators have generated 116,000 tons of hazardous waste in Sonoma County. This includes 100,600 tons of non-RCRA manifested hazardous waste, 12,200 tons of RCRA manifested hazardous waste, and 3,200 tons of uncategorized manifested hazardous waste.

2.3.5.50 Stanislaus County, CA

Since 2010, 3,565 generators have generated 206,500 tons of hazardous waste in Stanislaus County. This includes 188,500 tons of non-RCRA manifested hazardous waste, 15,600 tons of RCRA manifested hazardous waste, and 2,300 tons of uncategorized manifested hazardous waste.

2.3.5.51 Sutter County, CA

Since 2010, 796 generators have generated 7,400 tons of hazardous waste in Sutter County. This includes 5,800 tons of non-RCRA manifested hazardous waste, 1,600 tons of RCRA manifested hazardous waste, and 20 tons of uncategorized manifested hazardous waste.

2.3.5.52 Tehama County, CA

Since 2010, 509 generators have generated 8,100 tons of hazardous waste in Tehama County. This includes 7,900 tons of non-RCRA manifested hazardous waste, 200 tons of RCRA manifested hazardous waste, and 30 tons of uncategorized manifested hazardous waste.

2.3.5.53 Trinity County, CA

Since 2010, 132 generators have generated 50490 tons of hazardous waste in Trinity County. This includes 440 tons of non-RCRA manifested hazardous waste, 40 tons of RCRA manifested hazardous waste, and 10 tons of uncategorized manifested hazardous waste.

2.3.5.54 Tulare County, CA

Since 2010, 2,878 generators have generated 27,400 tons of hazardous waste in Tulare County. This includes 24,100 tons of non-RCRA manifested hazardous waste, 2,700 tons of RCRA manifested hazardous waste, and 700 tons of uncategorized manifested hazardous waste.

2.3.5.55 Tuolumne County, CA

Since 2010, 521 generators have generated 9,400 tons of hazardous waste in Tuolumne County. This includes 9,100 tons of non-RCRA manifested hazardous waste, 300 tons of RCRA manifested hazardous waste, and 40 tons of uncategorized manifested hazardous waste.

2.3.5.56 Ventura County, CA

Since 2010, 16,720 generators have generated 135,500 tons of hazardous waste in Ventura County. This includes 101,700 tons of non-RCRA manifested hazardous waste, 32,300 tons of RCRA manifested hazardous waste, and 1,400 tons of uncategorized manifested hazardous waste.

2.3.5.57 Yolo County, CA

Since 2010, 3,494 generators have generated 329,900 tons of hazardous waste in Yolo County. This includes 322,900 tons of non-RCRA manifested hazardous waste, 4,700 tons of RCRA manifested hazardous waste, and 2,300 tons of uncategorized manifested hazardous waste.

2.3.5.58 Yuba County, CA

Since 2010, 408 generators have generated 26,600 tons of hazardous waste in Yuba County. This included 24,900 tons of non-RCRA manifested hazardous waste, 1,600 tons of RCRA manifested hazardous waste, and 60 tons of uncategorized manifested hazardous waste.

2.4 Unmanifested Waste

Unmanifested waste is hazardous waste that is not required to be included on a manifest for tracking from generation to disposal. Some hazardous wastes are not required to be manifested because they are treated on site, recycled on site or off site, or are subject to less stringent management requirements to encourage appropriate management. For example, the public is not required to complete a manifest when transporting household hazardous waste. Other examples of unmanifested wastes include used oil filters, treated wood waste, universal waste, some photographic and silver-only waste, and some wastes that are self-transported.

HSC § 25135 (b)(1)(G) requires an "estimate of the types and volumes of hazardous waste that are generated but are not required to be manifested." Some unmanifested waste quantity information is available from various sources such as reports, surveys, stewardship programs, and databases. There is no standardized tracking mechanism that allows unmanifested waste to be easily tracked from "cradle-to-grave." The available data for universal waste is recorded by handlers by count and/or weight, not in units of volume. Wastes eligible to be managed under standards alternative to full hazardous waste regulation are recorded by weight, not in units of volume. Therefore, information on universal waste and waste types managed under standards alternative to full hazardous waste regulation is presented by count and/or weight.

In the California Environmental Reporting System (CERS), recycled material is recorded in gallons, tons, pounds, or kilograms. A gallon is a unit of volume, while tons, pounds, and kilograms are units of weight. Volume and weight are not interchangeable units, and this may present a challenge in reporting the amount of waste recycled on site. Research regarding waste treated on site and recycled on site is ongoing, as discussed in respective sections.

2.4.1 Universal Waste

In order to be eligible for management as universal waste, hazardous waste must be evaluated according to certain factors outlined in California Code of Regulations, title 22, § 66260.23:

- The waste or category of waste is listed in article 4 of chapter 11 of this division, or if not listed, a proportion of the waste stream exhibits one or more characteristics of hazardous waste identified in article 3 of chapter 11 of this division
- The waste or category of waste is not exclusive to a specific industry and is commonly generated by a wide variety of establishments, including households
- The waste or category of waste is generated by a large number of generators in relatively small quantities

- The risk posed by the waste during accumulation and transport is relatively low compared to other hazardous wastes
- Specific management standards would be protective of human health and the environment during accumulation and transport
- Regulation of the waste increases the likelihood that it will be diverted from non-hazardous waste management systems to recycling, treatment, or disposal in compliance with Division 4.5 of California Code of Regulations and division 20 of the California Health and Safety Code
- Regulation of the waste will improve implementation of and compliance with the hazardous waste regulatory program

As with other hazardous wastes, improper management of universal wastes may cause harm to human health or the environment. The universal waste regulations provide flexibility in the waste management requirements in order to encourage generators, transporters, and handlers to properly manage these hazardous wastes and to encourage recycling to recover resources.

The federal universal waste regulations are found in Title 40, CFR, part 273 and apply to five types of universal waste:

- Batteries
- Pesticides
- Mercury-containing equipment
- Lamps
- Aerosol cans

Some states follow only these federal regulations while other states regulate additional universal wastes. For example, California identifies and manages eight types of hazardous waste as universal waste:[50]

- Electronic devices, including those that contain a cathode ray tube
- Cathode ray tubes (CRTs)
- CRT glass
- Batteries
- Lamps
- Mercury-containing equipment
- Non-empty aerosol cans
- Photovoltaic (PV) modules

[50] Cal. Code Regs., tit. 22, §66261.9

Other wastes that are regulated as universal wastes in at least one state include:

- Antifreeze
- Polychlorinated biphenyl (PCB) ballasts
- Oil-based architectural paint
- Pharmaceuticals
- Compressed gas cylinders
- Pretreated dental wastewater
- Dental amalgam
- Used oil-based finishes

While there is some overlap between federal universal wastes and California's universal wastes, California lists additional wastes not included in the federal regulations and does not manage pesticides as universal wastes.

There are three types of regulated entities associated with universal waste – handlers, transporters, and destination facilities. Universal waste handlers can be responsible for universal waste generation, collection, or certain authorized treatments. A universal waste handler is defined as:[51]

1. a person who generates universal waste but does not accept universal waste from others, or
2. a person who accepts and accumulates universal waste generated by others, or
3. a person who accepts universal waste generated by others and conducts certain treatment[52] and recycling activities allowed by universal waste handler regulations.

The universal waste section of this Report will refer to universal wastes that are handled, since that includes both generated universal wastes and collected universal wastes. Information regarding the waste types and quantities of universal waste handled and treated is found in multiple databases, reports, and surveys as shown below in Table 2.4-1. Some of these sources are not designed to track universal waste from cradle-to-grave; instead, handlers use the source to notify DTSC of handler activities. It is important to note that, due to data source limitations, the amount of universal waste handled is an estimate.

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[51] "DTSC Universal Waste and How to Handle It Fact Sheet." *Dtsc.ca.Gov*, Dec. 2022, Website Link.
[52] Cal. Code Regs., tit. 22, §66273.70 through §66273.77

Table 2.4-1:Universal Waste Type and Data Source Used

Universal Waste Type	Data Source Used
Electronic Devices, including CRT Devices	DTSC Universal Waste Electronic Device (UWED) Annual Report
CRTs	DTSC UWED Annual Report
CRT Glass	DTSC UWED Annual Report
Batteries	DTSC Rechargeable Battery Survey
Lamps	Information Unavailable
Mercury-containing Equipment	Third Party Mercury Collector Website
Non-Empty Aerosol Cans	Information Unavailable
PV Modules	DTSC PV Module Annual Report

An estimated 78,310 tons of universal waste was handled in California in 2021. About 50,880 tons (65%) was electronic devices without a CRT. Devices with a CRT were the second most handled universal waste in California in 2021 at 14,210 tons (18%), followed by bare CRTs at 9,760 tons (12%), and rechargeable batteries at 2,210 tons (3%). CRT glass at 560 tons and PV modules at 690 tons each made up 1 percent of the universal waste handled. Mercury-containing equipment, specifically thermostats and loose switches, comprised 0.06 tons (less than 1%) of the universal waste handled in California in 2021. The quantity of lamps and non-empty aerosol cans handled in

2021 is unknown. Figure 2.4-1 and Table 2.4-2 shows handled universal waste in California by category for 2021.

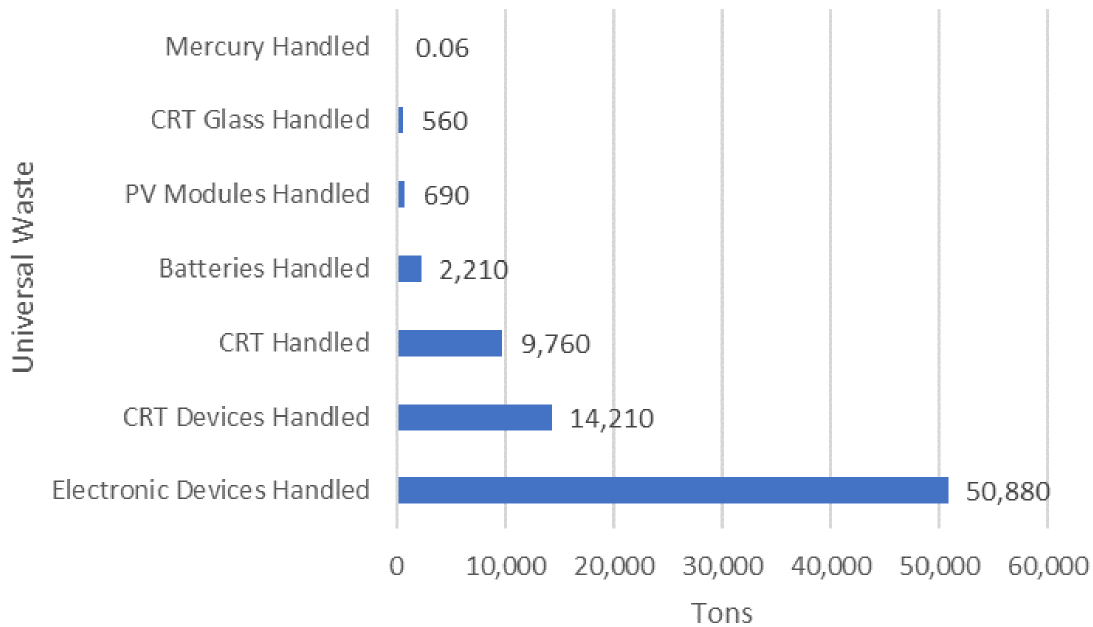

Figure 2.4-1: Handled Universal Waste, Tons, 2021

Figure 2.4-1 shows handled universal waste in California in 2021 in tons. The estimated total universal waste handled in California in 2021 was about 78,310 tons. Some facilities report electronic devices and/or PV modules by count rather than by weight. This figure only includes amounts reported by weight (tons). Mercury handled is mercury removed from thermostats and loose switches.

The five counties that handled the most universal waste reported by California handlers in 2021 were Los Angeles County at 12,350 tons (16%), Imperial County at 10,600 tons (14%), San Bernardino County at 8,460 tons (11%), Orange County at 5,320 tons (7%), and San Diego County at 3,460 tons (4%). These five counties account for about 52 percent of the universal waste handled in 2021 in California. Four of these counties are among the five most populous counties in California. Figure 2.4-2 and Table 2.4--2 shows the handled universal waste by county in 2021.

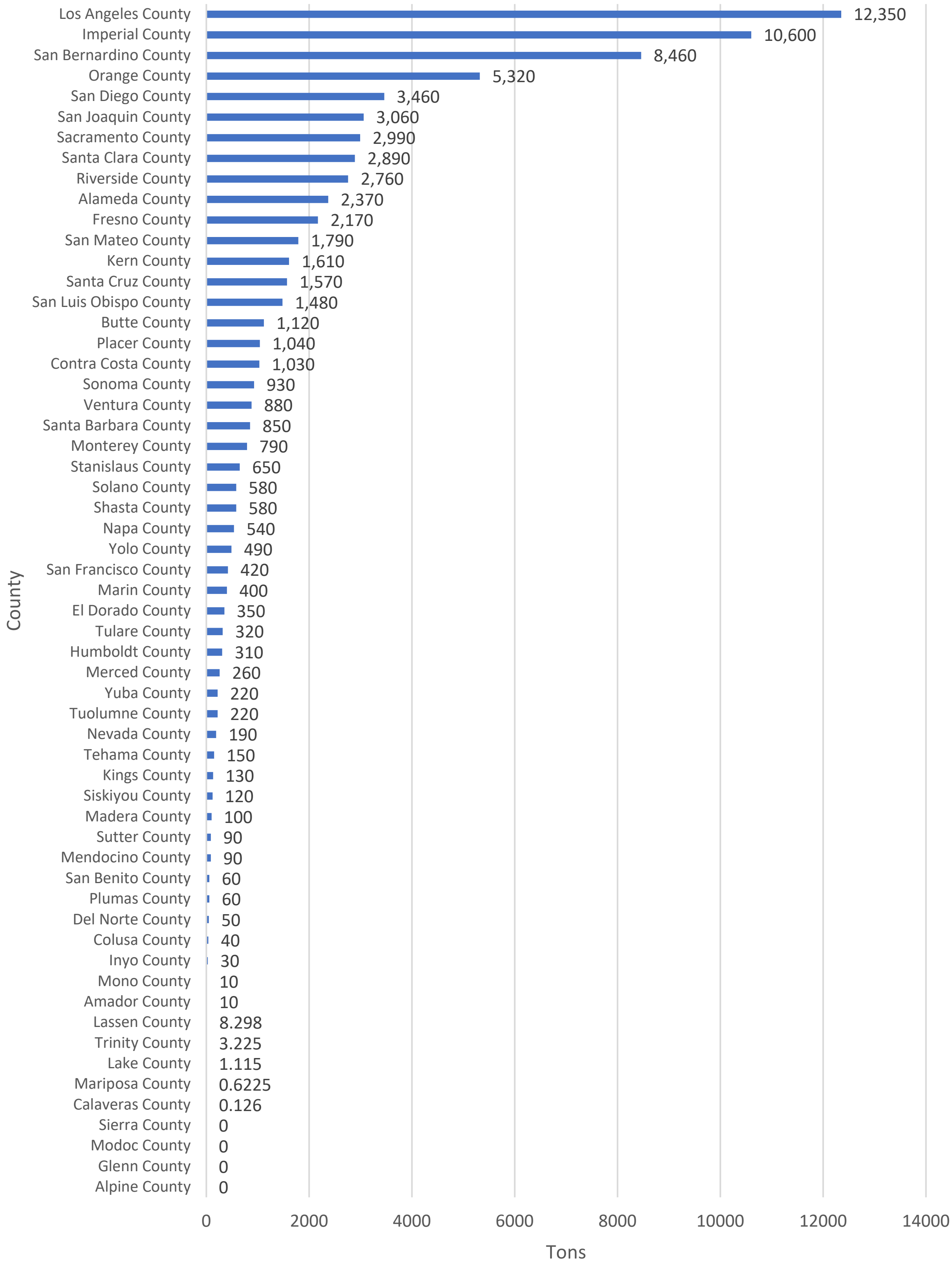
Los Angeles County 12,350
Imperial County 10,600
San Bernardino County 8,460
Orange County 5,320
San Diego County 3,460
San Joaquin County 3,060
Sacramento County 2,990
Santa Clara County 2,890
Riverside County 2,760
Alameda County 2,370
Fresno County 2,170
San Mateo County 1,790
Kern County 1,610
Santa Cruz County 1,570
San Luis Obispo County 1,480
Butte County 1,120
Placer County 1,040
Contra Costa County 1,030
Sonoma County 930
Ventura County 880
Santa Barbara County 850
Monterey County 790
Stanislaus County 650
Solano County 580
Shasta County 580
Napa County 540
Yolo County 490
San Francisco County 420
Marin County 400
El Dorado County 350
Tulare County 320
Humboldt County 310
Merced County 260
Yuba County 220
Tuolumne County 220
Nevada County 190
Tehama County 150
Kings County 130
Siskiyou County 120
Madera County 100
Sutter County 90
Mendocino County 90
San Benito County 60
Plumas County 60
Del Norte County 50
Colusa County 40
Inyo County 30
Mono County 10
Amador County 10
Lassen County 8.298
Trinity County 3.225
Lake County 1.115
Mariposa County 0.6225
Calaveras County 0.126
Sierra County 0
Modoc County 0
Glenn County 0
Alpine County 0
County
0
2000
4000
6000
8000
10000
12000
14000
Tons

Figure 2.4-2: Handled Universal Waste by County, Tons, 2021

Figure 2.4-2 shows handled universal waste by county in California in 2021 in tons. The estimated total universal waste handled in California in 2021 was 78,310 tons. Figure 2.4-2 does not include battery information since county data is not available for batteries. Some facilities report electronic devices and/or PV modules by count rather than by weight. This figure only includes amounts reported by weight (tons).

2.4.1.1 Electronic Devices

An electronic device is identified as hazardous waste when "it either exhibits the characteristic of toxicity and/or is a listed hazardous waste."[53] Electronic devices may contain materials – like toxic metals or polychlorinated biphenyls (PCBs) – that can pose a hazard to human health or the environment if managed incorrectly. Common examples of electronic devices include DVD players, computer central processing units (CPUs), and VCR players. Electronic devices become obsolete quickly as technology advances, so proper management of electronic waste is important to prevent release of toxic components into the environment.[54]

2.4.1.1.1 Universal Waste Electronic Devices (UWED)

Universal waste generators, handlers/collectors, and recyclers submit notifications and annual reports to DTSC either through mail or electronically through the Universal Waste Electronic Devices (UWED) online system. Annual reports to DTSC include quantities of univeral waste handled by a facility and, if applicable, the amount of waste the facility shipped to a destination. The waste types included in annual reports include electronic devices, including those that contain CRTs; bare CRTs; CRT glass; unspecified universal waste; metal[55]; and yokes.[56]

Universal waste handlers must submit annual reports if they generate 11,000 pounds or more of electronic devices, CRTs, and CRT glass collectively in a calendar year[57] or if they accept more than 220 pounds of electronic devices, CRTs, and CRT glass collectively from off-site sources in a calendar year.[58]

Annual reports submitted by mail or through UWED show the quantity of universal waste an individual facility handles and ships in a year, but they do not track waste from

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[53] Cal. Code Regs., tit. 22, §66260.10
[54] "E-Waste More Information." *Dtsc.ca.gov*, State of California, Website Link.
[55] Not universal waste but recorded in UWED.
[56] A part used in cathode ray tubes. Not universal waste but recorded in UWED.
[57] Cal. Code Regs., tit. 22, § 66273.32(d)(2)
[58] Cal. Code Regs., tit. 22, § 66273.32(d)(1)

generation to destination. The amount of waste a facility handles may not be the same as the amount it ships to a destination.

Additionally, handlers can send universal waste to other handlers before the waste is ultimately sent to a destination facility. As such, merely summing the quantities of universal waste listed as handled in annual reports can potentially count the same waste multiple times. In order to get a more accurate estimate of the amount of universal waste handled, the HWMP team analyzed 2021 annual reports from the UWED online system to determine which facilities were only handlers, which facilities were listed as both handlers and destinations, and which were listed only as destinations. The team omitted waste quantities from facilities listed as both handlers and destinations in an attempt to estimate the quantity of waste handled once as opposed to multiple times.

An example of this is below:

Example of a Facility that is Both a Handler and a Destination

Handler Name	Handler Address	Type	Destination Name	Destination Address
Facility A	123 Main St.	Shipped-Domestic	Facility B	987 Elm St.
Facility B	987 Elm St.	Shipped-Domestic	Facility C	456 Example St.

In this simplified example, the handler at Facility A sent universal waste to a second handler at Facility B and recorded the quantity handled in its annual report. Facility B sent universal waste to Facility C and recorded the quantity handled in its annual report. Since handlers only report the total quantity generated or accepted and not the entities they received waste from, annual reports can include duplicate waste. To avoid possible double-counting, the HWMP team will omit the amount handled by Facility B when tallying the total amount of universal waste handled, because Facility B is listed as a handler and a destination, while Facility A is listed only as a handler and Facility C is listed only as a destination.

This method may result in an underestimate of the amount of universal waste handled in a year, because a facility that receives waste from another handler may also collect waste on its own. For example, Facility B received waste from Facility A but may have also collected universal waste directly from generators or the public. Conversely, summing the total amount of waste handled in one year without examining which facilities are listed as handlers, destinations, or both could result in an overestimation of the amount of universal waste handled in one year. This example shows the limitations of using annual reports and the UWED online system to estimate quantities of handled universal waste.

It is also important to note that information in the UWED online system may contain errors. Examples include but are not limited to: typographical errors; corporate offices listed as destinations instead of facilities more likely to receive universal waste; and errors in address names, such as “road” instead of “street.” These typos may result in errors when mapping and comparing handler addresses with destination addresses. The HWMP team attempted to correct these errors, but some errors may still exist.

Another important error that may appear in the UWED online system is miscategorization of waste. Handlers may record their universal waste in the wrong category. For example, a handler may record a CRT device as an electronic device. While this type of error may not influence the estimated total weight of universal waste handled, it may influence the estimated weight of a category of universal waste.

Another important feature that may influence the data that appears in the UWED online system is whether a facility is in business when a report is pulled. Facilities can open, close, and reopen in the same year. The HWMP team pulls reports only on active facilities, but a facility that handled waste in the previous year may no longer be active when the team requests an annual report. The HWMP team pulled the UWED data used in this Report in March 2022.

2.4.1.1.2 Handled Electronic Devices

It is difficult to establish an accurate estimate of the number of electronic devices handled in California in a given year, because electronic devices can be recorded in annual reports in two different ways – by weight or by sheer number of devices. Because electronic device weights vary greatly – a mobile phone versus a television, for example – there is no standard conversion from device count to weight, or vice versa.

Figure 2.4-3 shows handled electronic devices by county by weight. Of the 50,880 tons handled in California in 2021, handlers in Los Angeles County handled 9,560 tons (19%), handlers San Bernardino County handled 7,430 tons (15%), and handlers in Orange County handled 4,510 tons (9%). Table 2.4-2 shows the handled electronic devices by county in 2021 in tons.

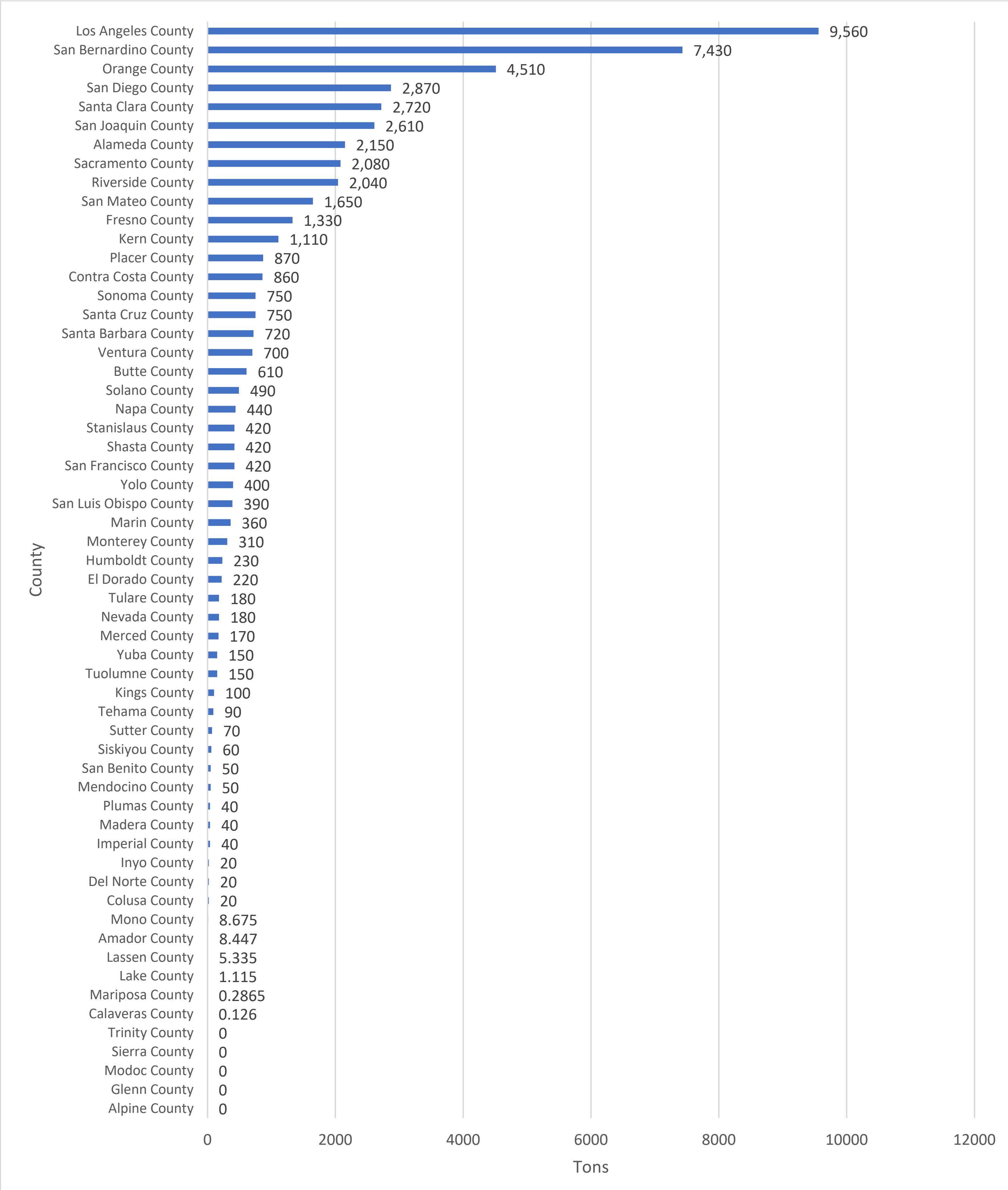
Los Angeles County 9,560
San Bernardino County 7,430
Orange County 4,510
San Diego County 2,870
Santa Clara County 2,720
San Joaquin County 2,610
Alameda County 2,150
Sacramento County 2,080
Riverside County 2,040
San Mateo County 1,650
Fresno County 1,330
Kern County 1,110
Placer County 870
Contra Costa County 860
Sonoma County 750
Santa Cruz County 750
Santa Barbara County 720
Ventura County 700
Butte County 610
Solano County 490
Napa County 440
Stanislaus County 420
Shasta County 420
San Francisco County 420
Yolo County 400
San Luis Obispo County 390
Marin County 360
Monterey County 310
Humboldt County 230
El Dorado County 220
Tulare County 180
Nevada County 180
Merced County 170
Yuba County 150
Tuolumne County 150
Kings County 100
Tehama County 90
Sutter County 70
Siskiyou County 60
San Benito County 50
Mendocino County 50
Plumas County 40
Madera County 40
Imperial County 40
Inyo County 20
Del Norte County 20
Colusa County 20
Mono County 8.675
Amador County 8.447
Lassen County 5.335
Lake County 1.115
Mariposa County 0.2865
Calaveras County 0.126
Trinity County 0
Sierra County 0
Modoc County 0
Glenn County 0
Alpine County 0
County
0
2000
4000
6000
8000
10000
12000
Tons

Figure 2.4-3: Handled Electronic Devices by County, Tons, 2021

Figure 2.4-4 shows handled electronic devices by county by count. Of the 386,660 devices handled in California in 2021, handlers in Alameda County handled 142,620 devices (37%), handlers in Placer County handled 119,090 devices (31%), and handlers in San Diego County handled 76,080 devices (20%). Table 2.4--2 shows handled electronic devices by county in California in 2021 by count.

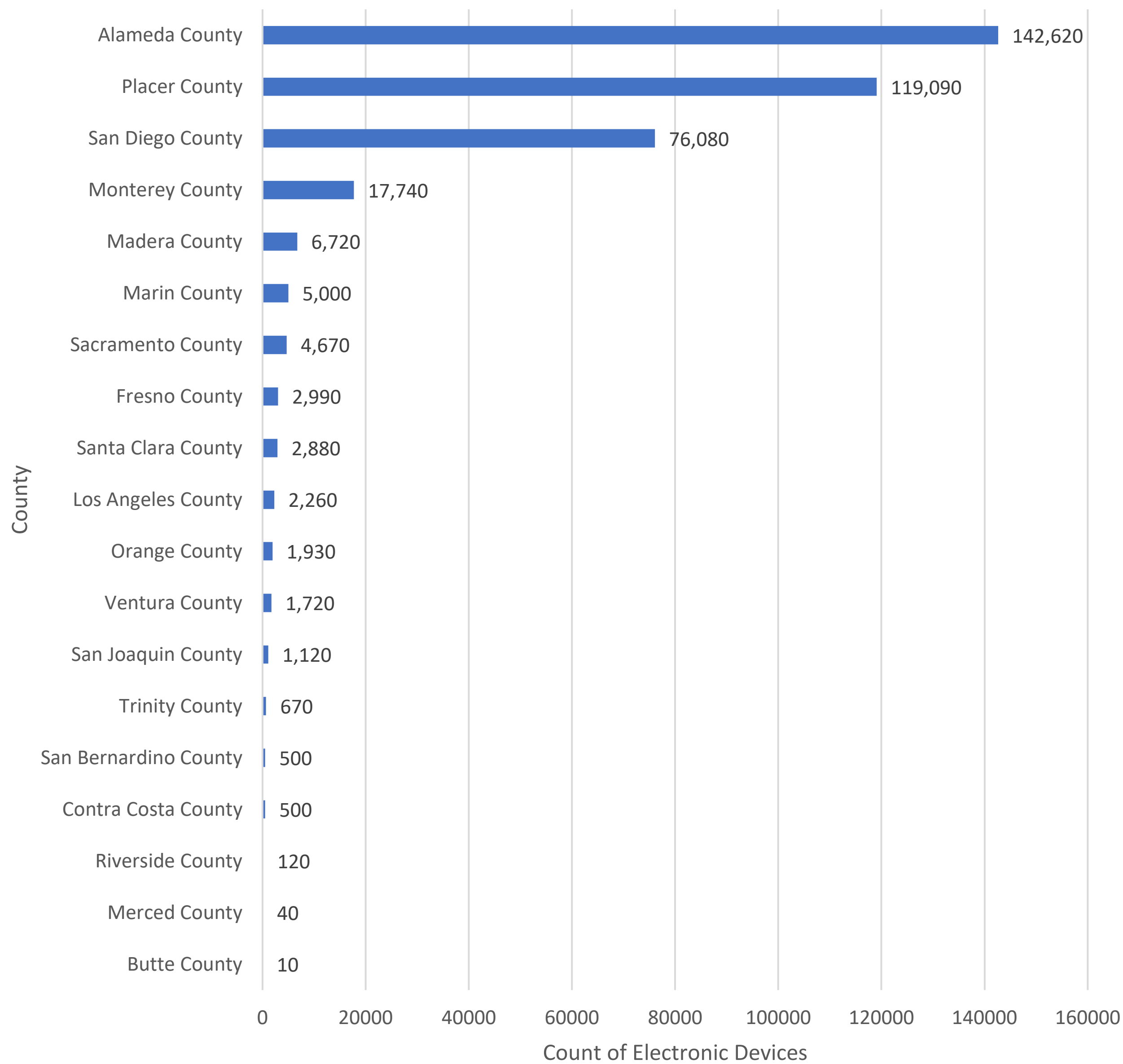

Figure 2.4-4: Count of Handled Electronic Devices by County, 2021

2.4.1.1.3 CRT Devices

Electronic devices that contain a cathode ray tube are known as CRT devices. For the purposes of this Report, they are included as a subcategory separate from other electronic devices.

2.4.1.1.3.1 Handled CRT Devices

Like electronic devices, CRT devices can be recorded in UWED either by weight or by sheer number of devices. Unlike with electronic devices, however, there is a standard conversion from CRT device count to weight – multiplying the number of devices by 50 pounds.[60] The conversion is used to account for the weight of yokes, metal, and CRTs that may be part of a CRT device.

Figure 2.4-5 shows handled CRT devices by county in 2021 in tons. Of the 14,210 tons of CRT devices handled in California in 2021, handlers in Los Angeles County handled 2,500 tons (18%), handlers in San Luis Obispo County handled 1,090 tons (8%), and handlers in Imperial County handled 1,060 tons (7%). Table 2.4-2 shows handled CRT devices by county in California in 2021 in tons.

[60] Standard used by DTSC to represent the average weight of a CRT device.

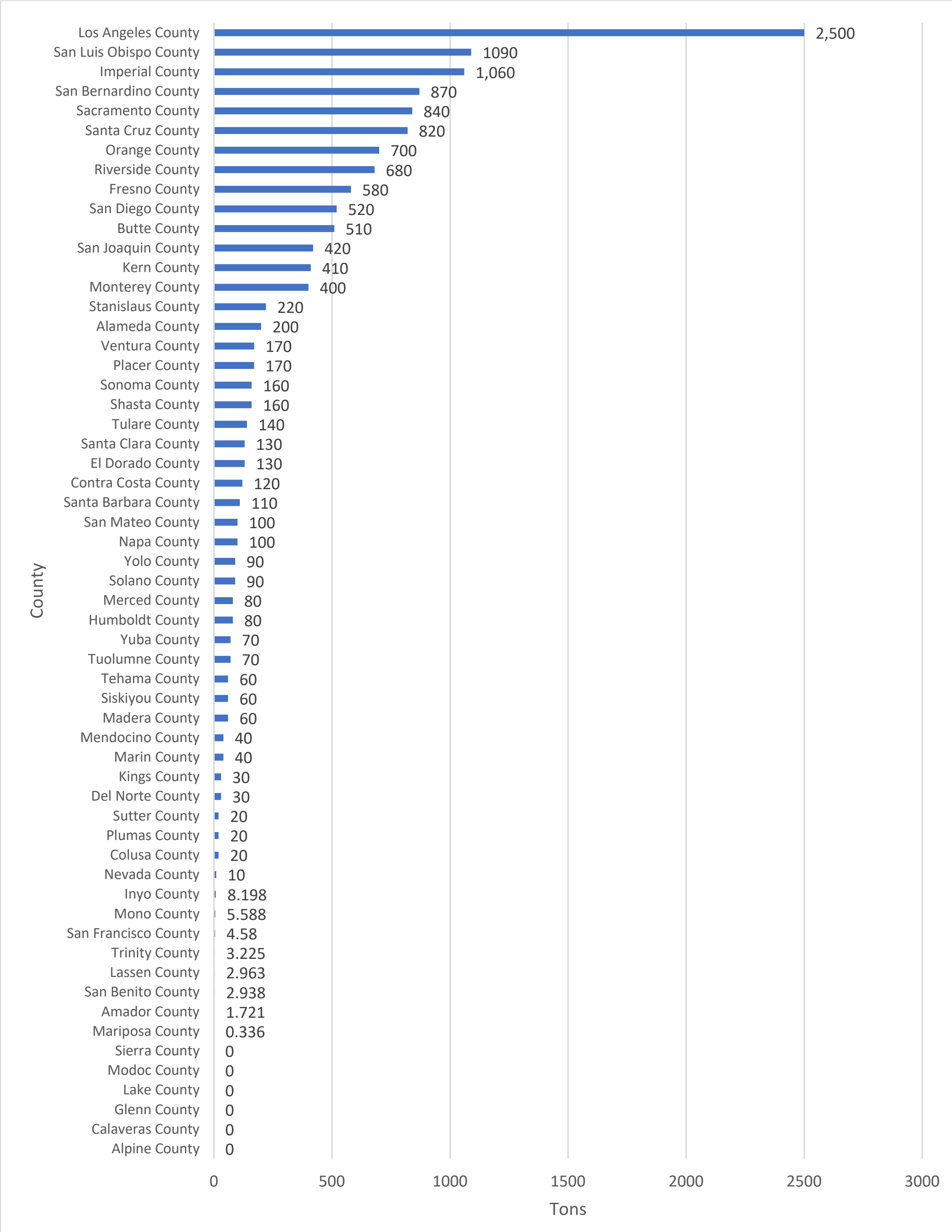
Los Angeles County 2,500
San Luis Obispo County 1090
Imperial County 1,060
San Bernardino County 870
Sacramento County 840
Santa Cruz County 820
Orange County 700
Riverside County 680
Fresno County 580
San Diego County 520
Butte County 510
San Joaquin County 420
Kern County 410
Monterey County 400
Stanislaus County 220
Alameda County 200
Ventura County 170
Placer County 170
Sonoma County 160
Shasta County 160
Tulare County 140
Santa Clara County 130
El Dorado County 130
Contra Costa County 120
Santa Barbara County 110
San Mateo County 100
Napa County 100
Yolo County 90
Solano County 90
Merced County 80
Humboldt County 80
Yuba County 70
Tuolumne County 70
Tehama County 60
Siskiyou County 60
Madera County 60
Mendocino County 40
Marin County 40
Kings County 30
Del Norte County 30
Sutter County 20
Plumas County 20
Colusa County 20
Nevada County 10
Inyo County 8.198
Mono County 5.588
San Francisco County 4.58
Trinity County 3.225
Lassen County 2.963
San Benito County 2.938
Amador County 1.721
Mariposa County 0.336
Sierra County 0
Modoc County 0
Lake County 0
Glenn County 0
Calaveras County 0
Alpine County 0
County
0
500
1000
1500
2000
2500
3000
Tons

Figure 2.4-5: *Handled CRT Devices by County, Tons, 2021*

2.4.1.2 Cathode Ray Tubes (CRTs)

A CRT[61] is a vacuum tube that produces images and can be found in devices such as televisions. CRTs and CRT glass contain substances, like lead, that may pose a hazard to human health or the environment if managed incorrectly.

Advances in technology have led to greatly decreased demand for new CRT devices. In the past, recyclers were able to repurpose used CRTs and CRT glass for the manufacture of new CRTs.[62] But the demand for new CRTs has collapsed in favor of new flat panel technologies, and that decreased demand has created a stockpile of used CRTs and CRT glass.

Because of rising costs, negative economic incentives, and shifts in CRT glass markets, some CRT processors and recyclers are choosing to store the glass indefinitely rather than send it for recycling or disposal. This increases the risk of mismanagement and/or abandonment of CRTs.[63]

2.4.1.2.1 Handled CRTs

CRTs can be recorded as a count or a weight in the UWED online system. CRTs can be converted from count to weight by multiplying the number of CRTs by 25 pounds.[64]

Figure 2.4-6 shows tons of handled CRTs by county in 2021.Of the 9,760 tons of CRTs handled in California in 2021, handlers in Imperial County handled 8,940 tons (92%), handlers in Los Angeles County handled 230 tons (2%), and handlers in Fresno County handled 140 tons (1%). Table 2.4-2 shows handled CRTs by county in 2021 in tons.

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[61] Cal. Code Regs., tit. 22, §66260.10

[62] Chandler, David L. "CRTs Going down the Tubes? Hardly." *MIT News* | *Massachusetts Institute of Technology*, Massachusetts Institute of Technology, 2 Feb. 2010, Website Link.

[63] IAITAM, Info. "The Dirty Problem of CRT Glass." *IAITAM*, International Association of Information Technology Asset Managers, Inc., 12 July 2021, Website Link.

[64] Standard used by DTSC for the weight of a CRT.

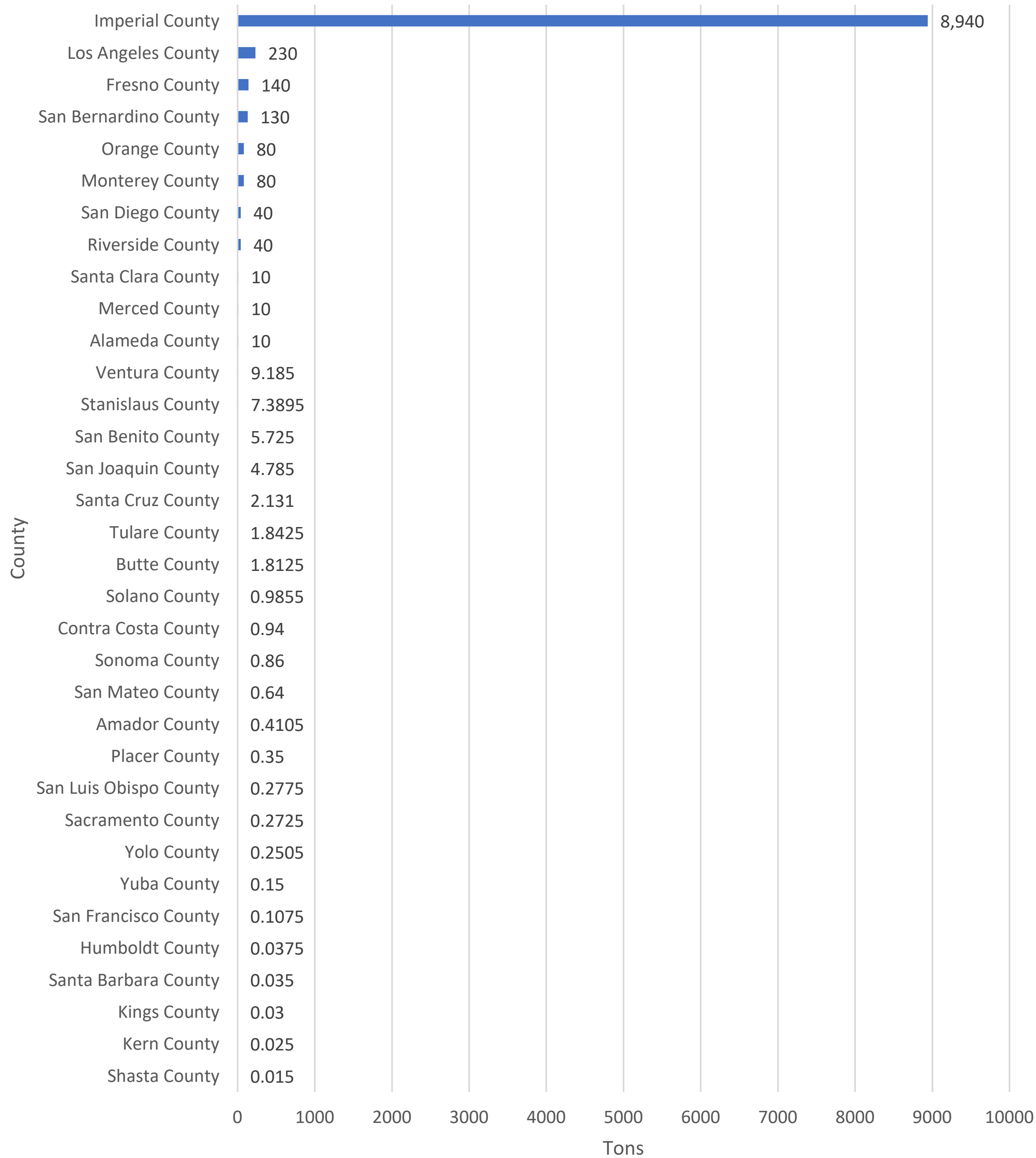

Figure 2.4-6: Handled CRTs by County, Tons, 2021

2.4.1.3 CRT Glass

CRT glass is the glass from a CRT. Each CRT can contain up to 8 pounds of lead. Glass may come from a CRT because of treatmentor accidental breakage.

2.4.1.3.1 Handled CRT Glass

CRT glass is recorded in UWED by weight.

About 560 tons of CRT glass was handled in California in 2021, nearly all of it in Imperial County. Handlers in San Bernardino County, San Joaquin County, and Stanislaus County each handled less than one ton of CRT glass. Table 2.4-2 shows handled CRT glass by county in 2021 in tons.

2.4.1.4 Batteries

Batteries can contain corrosive chemicals and/or toxic metals that can cause harm to human health or the environment if managed incorrectly. Most consumer-type batteries are considered universal wastes. Examples of universal waste batteries include but are not limited to:

- AA batteries
- AAA batteries
- C cell batteries
- D cell batteries
- Rechargeable batteries
- Button batteries

Lead-acid batteries, such as the type found in motor vehicles, are not eligible to be managed as universal wastes.[65]

Assembly Bill (AB) 1125 enacted the California Rechargeable Battery Recycling Act of 2006. This bill was codified in Chapter 8.4 in the Public Resources Code. These statutes , require retailers to have a system in place to accept and collect used rechargeable batteries for reuse, recycling, or disposal. Retailers are not required to accept other kinds of universal waste batteries. Chapter 8.4 defines rechargeable batteries as small, nonvehicular, rechargeable nickel-cadmium, nickel metal hydride,

[65] Management of spent lead-acid batteries can be found in Cal. Code Regs., tit. 22, § 66266.81

lithium-ion, or sealed lead-acid batteries, or a battery pack containing these types of batteries.[66]

Chapter 8.4 also requires DTSC to survey battery handling or battery recycling facilities and to post the amount, by weight, of each type of rechargeable battery returned for recycling on the DTSC website. However, battery handling or battery recycling facilities are not required to respond to DTSC's survey.

The survey includes four types of rechargeable batteries:

- Lithium ion (Li-ion)
- Nickel-cadmium (Ni-Cd)
- Nickel metal hydride (Ni-MH)
- Small sealed-lead acid

Li-ion rechargeable batteries are often used in portable electronic devices, such as cell phones, digital cameras, and electronic cigarettes. Ni-Cd rechargeable batteries are often used in portable electronic devices, such as cordless phones, two-way radios, and cordless power tools. Ni-MH rechargeable batteries are found in older cell phones, some cordless power tools, and digital cameras. Small sealed-lead acid rechargeable batteries are found in mobility scooters, emergency lighting, and hospital equipment.

Review of the survey responses indicates there are four main limitations with rechargeable battery data:[67]

1. Some battery handlers and recyclers do not track the state from which the batteries are collected.
2. Batteries contained within electronic devices that are recycled are not counted separately but may represent a significant portion of the total quantity.
3. There may be duplicate data as some battery handlers collect batteries from other collection points.
4. California law does not require battery handlers or recyclers to report the number or weight of batteries collected for recycling.

Because the data is acquired through a survey, there is no way to determine whether information reported through the survey is accurate.

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[66] AB 1125 2005. Assembly Bill (AB) 1125. Rechargeable battery recycling act. Available at: Website Link. Accessed 18 Aug 2022

[67] "How Is California Doing with Recycling Rechargeable Batteries?" *Dtsc.ca.gov*, State of California, 29 Aug. 2022, Website Link.

Additional data gaps from battery collection include:

- Battery handlers and recyclers do not report the county where batteries are collected.
- Battery handlers and recyclers do not report what happens to the batteries after collection.
- Only rechargeable batteries are tracked; the DTSC survey does not track other universal waste type batteries.

The quantity of batteries collected per year, as reported through the survey, is likely an underestimate since battery handlers or recyclers are not required to report the number or weight of batteries collected for recycling. While a change to existing statute could make the survey mandatory, other limitations listed above may limit the usability of the collected data. For example, if both handlers and recyclers are required to respond to the survey, duplication of data will likely increase because a handler and a recycler may record the same set of batteries. Other limitations, such as a lack of county data, are unlikely to be solved by statutory or regulatory changes. Changes would also require time to implement and may require additional resources, such as personnel and funding for enforcement or data management.

2.4.1.4.1 Handled Batteries

Figure 2.4-7 shows handled batteries by type in 2021 in tons. Handlers collected spproximately 2,210 tons of batteries in California in 2021. The vast majority of batteries collected – 87 percent – were small sealed-lead acid batteries, followed by Li-ion, Ni-Cd, and Ni-MH batteries. Table 2.4-3 shows handled batteries by type in 2021 in tons.

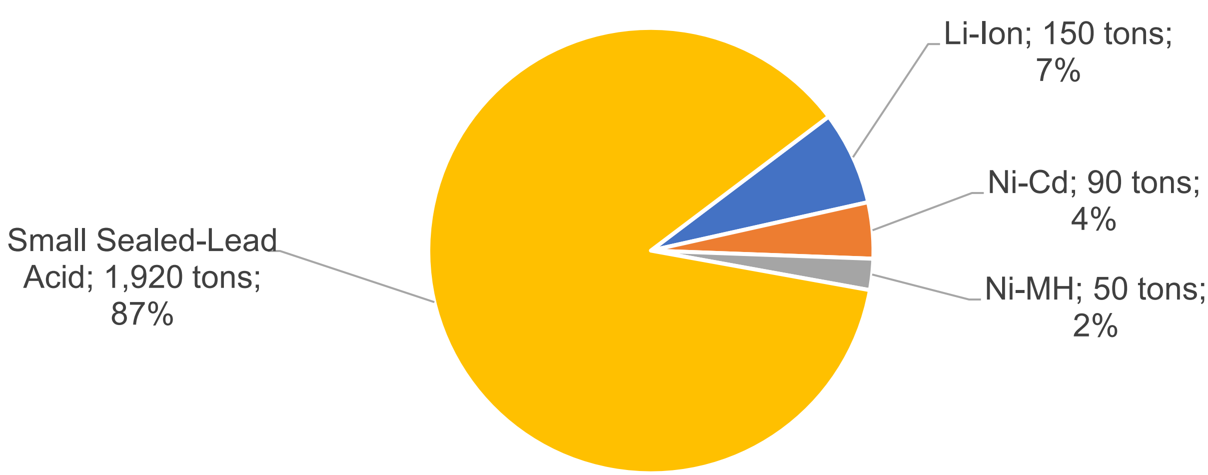

Figure 2.4-7: Handled Batteries by Type, Tons, 2021

Figure 2.4-8 shows handled batteries by type in tons from 2017 to 2021. Small sealed-lead acid rechargeable batteries were consistently the most-collected battery type, according to the DTSC rechargeable battery survey. Ni-MH rechargeable batteries are consistently the least collected battery type. There was an increase in battery collection from 2017 to 2020, followed by a decrease in battery collection in 2021. Table 2.4-3 shows handled batteries by type from 2017-2021.

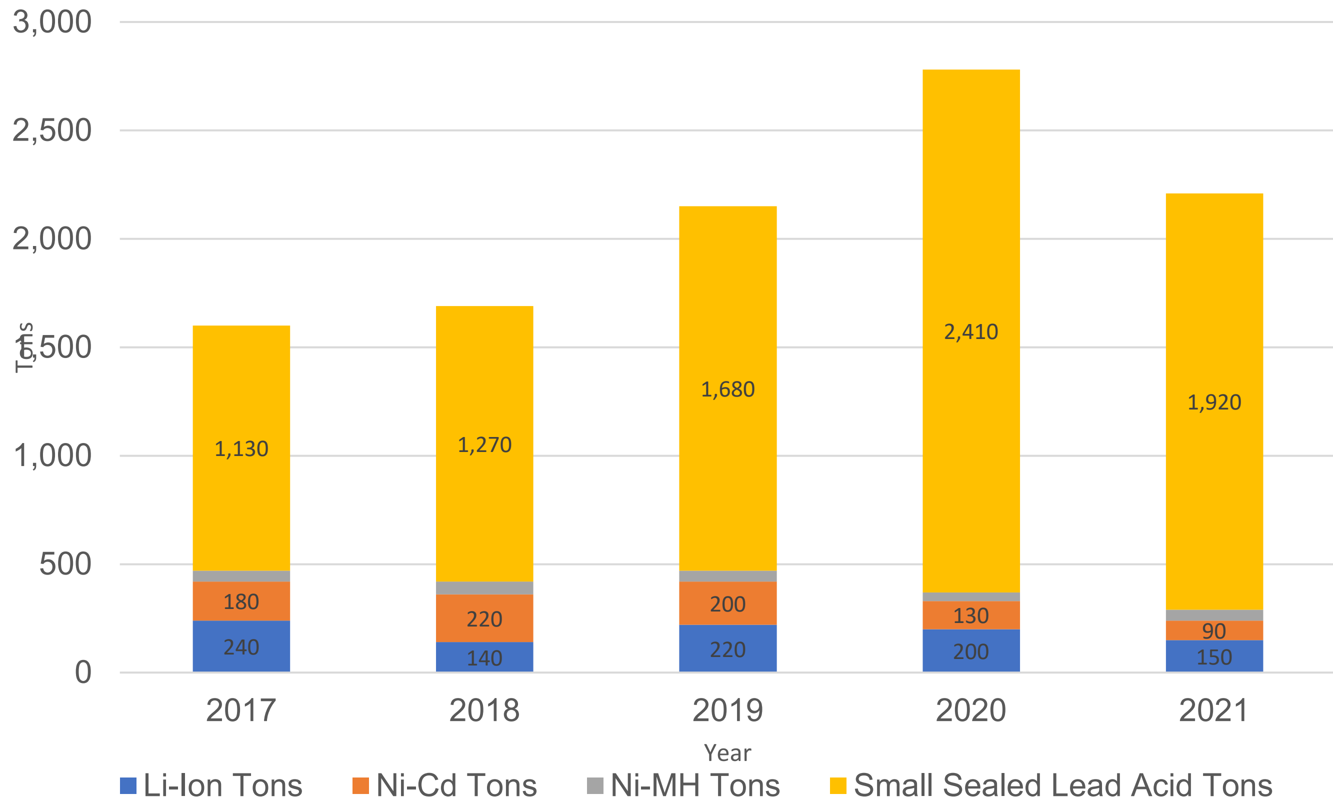

Figure 2.4-8: Handled Batteries by Type, Tons, 2017-2021

Figure 2.4-9 shows handled batteries by type in tons from 2017 to 2021 with small sealed-lead acid batteries removed. The intent of this graph is to better show the trends in the three less-collected battery types – Li-ion, Ni-Cd, and Ni-MH batteries. In 2017, 2019, 2020, and 2021, Li-ion batteries were the most-collected of these three types. In 2018, Ni-Cd rechargeable batteries were the most-collected of the three.

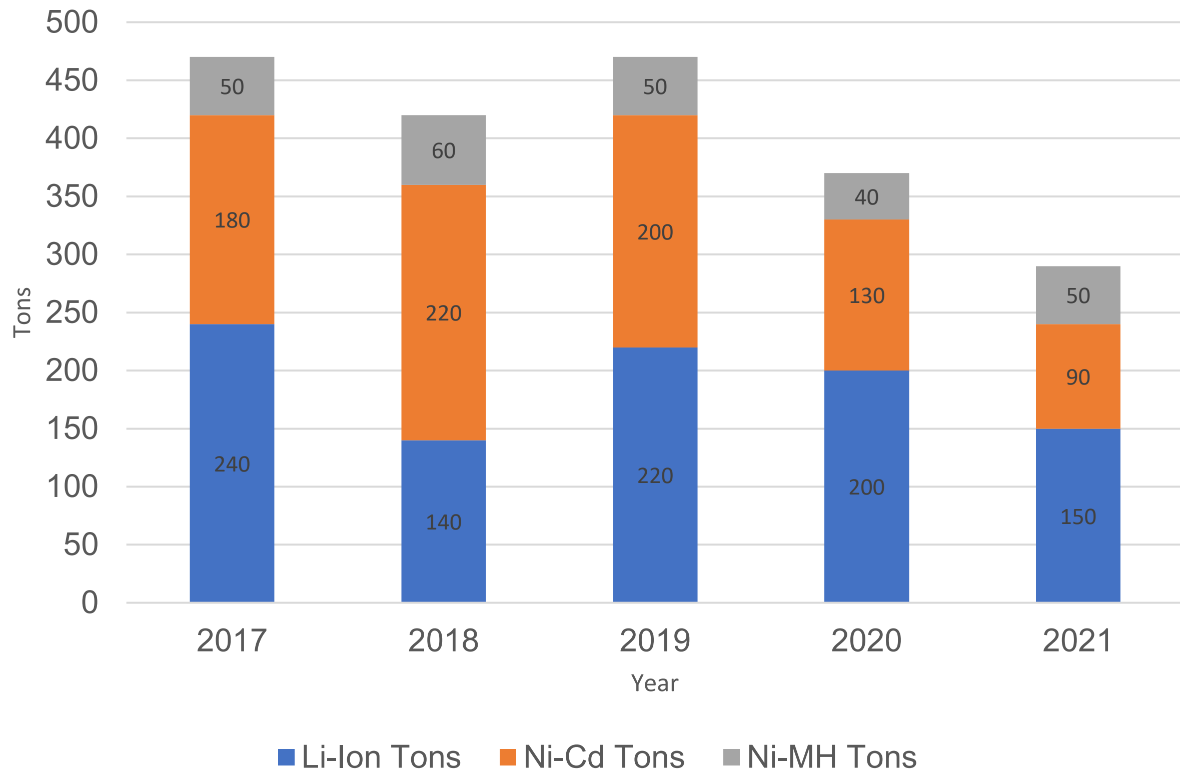

Figure 2.4-9: Handled Batteries by Type – Small Sealed-Lead Acid Batteries Omitted, Tons, 2017-2021

2.4.1.5 Lamps

Lamps are defined in Cal. Code Regs., tit. 22, § 66273.9 as the bulb or tube portion of an electric lighting device. Universal waste lamps include lamps that exhibit a characteristic of hazardous waste, mercury-added lamps that meet the listing description in M003 in section 66261.50, and/or products that contain lamps and/or mercury-added lamps.

Cal. Code Regs., tit. 22, § 66273.5(c) describes how lamps become a waste. A used lamp becomes a waste on the day it is discarded. An unused lamp that is not a retrograde material[68] becomes a waste on the day it is discarded. An unused lamp that

[68] Per Cal. Code Regs., tit. 22, § 66260.10, a retrograde material is "any hazardous material which is not to be used, sold, or distributed for use in an originally intended or prescribed manner or for an originally intended or prescribed purpose and which meets any one or more of the following criteria: has undergone chemical, biochemical, physical or other changes due to the passage of time or the environmental conditions under which it was stored; has exceeded a specified or recommended shelf life; is banned by law, regulation, ordinance or decree; cannot be used for reasons of economics, health or safety or environmental hazard."

is a retrograde material becomes a waste on the day it becomes a recyclable material. Examples of universal waste lamps include:[69]

- Fluorescent light tubes and bulbs
- High intensity discharge lamps
- Metal halide lamps
- Sodium lamps
- Neon bulbs

Universal waste lamps may contain mercury vapor that can be released to the environment if managed incorrectly and can cause harm to human health and/or the environment.

The quantity of generated universal waste lamps is not available for this Report as of 2022. Some universal waste lamp data is collected through household hazardous waste collection information, but this does not include all electric lamp waste and is likely an underestimate. Information on universal waste lamp data reported through household hazardous waste collection can be found in section 2.2.2.1, Handled Household Hazardous Waste.

2.4.1.6 Mercury-Containing Equipment

Some mercury-containing wastes must be managed as fully-regulated hazardous waste. Mercury-containing equipment that may be managed as universal waste includes the following:

- Mercury thermometers
- Mercury-containing motor vehicle light switches
- Non-automotive mercury switches
- Dental amalgam
- Mercury pressure or vacuum gauges
- Mercury-added novelties
    - With mercury batteries
    - Painted with mercury-containing paint
    - With liquid mercury
    - With mercury switches
- Mercury counterweights and dampers
- Mercury-added dilators and weighted tubing
- Mercury-added rubber flooring
- Mercury gas-flow regulators

[69] "Universal Waste for Residents – Fluorescent Lamps." *Dtsc.ca.gov*, State of California, Website Link.

Assembly Bill (AB) 707[70] enacted a recast of the existing Mercury Thermostat Collection Act of 2008 to the Mercury Thermostat Collection Act of 2021. This bill was codified in the Health and Safety Code. These statutes require manufacturers to retain or contract with a qualified third party by March 1, 2022, to "develop and implement a convenient, cost-effective, and efficient program" to "collect, handle, and arrange for the appropriate management of out-of-service mercury-added thermostats." These statutes also require that for 90 percent of California's residents, a collection location must be within 15 miles of their residence. Each county must have at least one collection location, "unless there is no location in the county that is required to participate under the Act or willing to participate voluntarily." By July 1, 2022, the third party was required to develop and implement a statewide educational and outreach campaign, which was to include the following:

- Importance of safe recycling and disposal of out-of-service mercury-added thermostats
- Where and how to access thermostat collection locations
- How to access available thermostat collection incentives
- Coordination of program activities with stakeholders
- Creation and and distribution of information materials
- A publicly accessible internet website
- Thermostat collection incentives to consumers

The obligations imposed by the Mercury Thermostat Collection Act of 2021 will remain in effect until January 1, 2030.

For this section of this Report, the HWMP team gathered information on mercury collection from one third party collector that collects mercury-containing thermostats and loose switches from business. The third party mercury collector sends collection boxes to businesses. Individuals drop off thermostats and loose switches to the businesses. Once the collection box is full or the one-year storage time period is reached,[71] the collection box is sent to a facility to process the mercury within the thermostats and loose switches.[72]

The information used for this Report was accessed through requestable online reports from the third party's website. The third party mercury collector reports its collection information on its website through requestable online reports.

[70] AB 707 2021. Assembly Bill (AB) 707. Mercury Thermostat Collection Act of 2021. Available at: Website Link. Accessed 19 Aug 2022

[71] Cal. Code Regs., tit. 22, § 66273.35(a)

[72] "TRC Training Video for HVAC Wholesalers & Other Collection Locations." *YouTube*, YouTube, 29 Apr. 2013, Website Link. Accessed 26 Sept. 2022.

2.4.1.6.1 Handled Mercury-Containing Equipment

In 2021, the third party mercury collector's stewardship program collected about 120 pounds[73] of mercury from thermostats and loose switches. This equates to about 0.06 tons of mercury.

Figure 2.4-10 shows handled mercury by county in 2021 in tons. About 120 pounds, or .06 tons, of mercury was collected from thermostats and loose switches in California in 2021. Riverside County handlers reported the most mercury collected from thermostats and loose switches in 2021 at 0.0169 tons (28%), followed by Los Angeles County handlers at 0.0121 tons (20%) and Fresno County handlers at 0.0054 tons (9%). Table 2.4-2 shows tons of mercury handled by county in 2021.

[73] 1 pound is about 453 grams, and each switch contains about 4 grams of mercury.

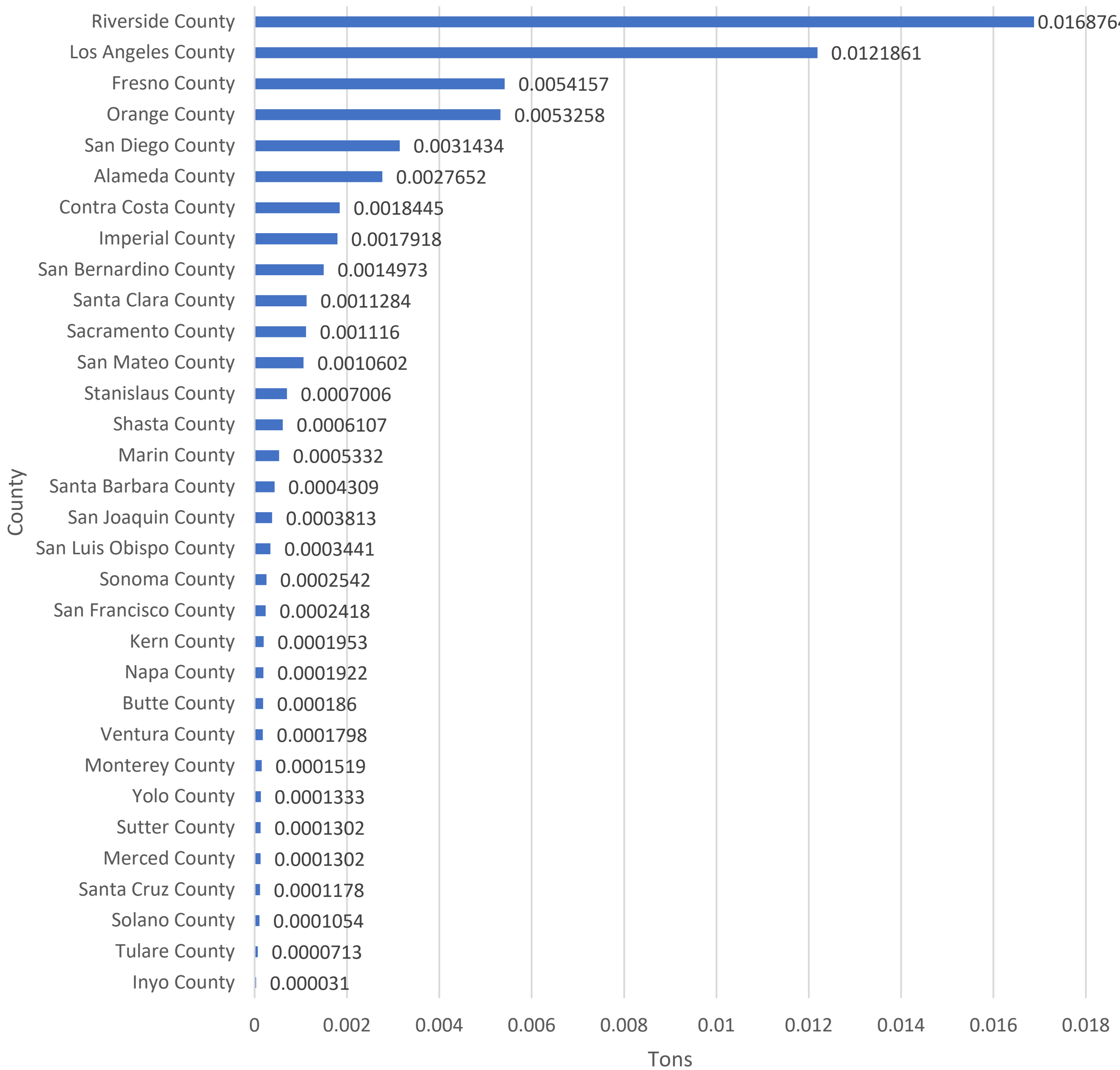

Figure 2.4-10: Handled Mercury by County, Tons, 2021

2.4.1.7 Non-Empty Aerosol Cans

Non-empty aerosol cans may contain a variety of hazardous materials, such as toxic or ignitable materials. Provided they are not a RCRA-regulated hazardous waste, aerosol containers that are emptied of contents and propellant to the maximum extent practical under normal use are exempt from regulation under division 4.5 of the California Code of Regulations and Chapter 6.5 of division 20 of the Health and Safety Code.[74]

The quantity of non-empty aerosol cans that qualify as generated universal waste is not available for this Report as of 2022. Some aerosol can data is collected through household hazardous waste collection information, but this does not include all aerosol can waste and is likely an underestimate of the total amount handled in 2021. Information on aerosol can data reported through household hazardous waste collection can be found in section 2.2.2.1 of this Report, Handled Household Hazardous Waste.

2.4.1.8 Photovoltaic Modules

A PV module is a device consisting of or containing one or more electrically connected photovoltaic cells that are designed to convert solar radiation into electrical energy.[75] The term "PV module" includes the components of the module that cannot be removed without breaking the module's glass. PV modules come in different sizes and can be made using a variety of materials. PV modules include, but are not limited to, solar panels and products that contain solar panels, such as solar-powered garden lights or solar powered backpacks.[76]

Per the California Energy Commission, the 2019 Building Energy Efficiency Standards require newly constructed low-rise residential buildings to have a solar PV system. According to the United States Office of Energy Efficiency & Renewable Energy, PV modules have an estimated life span of about 30 to 35 years.[77] Based on this information, there will likely be an increase in the amount of solar panel waste entering the waste stream in approximately 30-35 years – about 2050-2055. There is currently limited national recycling capacity for solar panels.

Handlers of PV modules submit an annual report to DTSC that includes the quantity of PV modules handled by a facility by either count or weight, the destination the modules were sent to, and how the modules were managed once sent to a destination. The PV module report is best suited to determining how much universal waste a facility handled in a given time period instead of determining the total quantity of PV modules handled annually.

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[74] Cal. Code Regs., tit. 22, § 66261.7(m)(1)
[75] Cal. Code Regs., tit. 22, §66260.10
[76] "Photovoltaic (PV) Modules (Including Solar Panels) Universal Waste Management – Frequently Asked Questions." *Dtsc.ca.gov*, State of California, Website Link.
[77] "End-of-Life Management for Solar Photovoltaics." *Energy.gov*, U.S. Department of Energy, Website Link.

Some facilities in the PV module report are listed as both handlers and destinations. In order to estimate how many modules were handled without counting potential duplicate waste, the HWMP team omitted quantities from facilities listed as both a handler and a destination in an attempt to estimate the quantity of modules handled once as opposed to multiple times.

Facilities may report handled PV modules to DTSC by either count or weight. There is not a conversion factor between count and weight, because PV modules can be made of a variety of materials, come in a variety of sizes, and may include wastes that contain PV modules, such as solar-powered garden lights.

Some facilities reported handling a weight of panels but reported sending a count of panels to a destination. For example, a facility reported handling 17,000 pounds of PV modules but reported sending about 280 panels to a destination. The variance in reporting created some difficulty in calculating an estimate of PV modules handled.

2.4.1.8.1 Handled Photovoltaic Modules

Figure 2.4-11 shows the handled PV modules by county in California in 2021 in tons. About 690 tons of PV modules were handled by California handlers in 2021. Handlers in Fresno County handled 120 tons (17%), handlers in Kern County handled 90 tons (13%), And handlers in Sacramento County handled 70 tons (10%) of PV modules. Table 2.4-2 shows tons of PV modules handled by county in 2021.

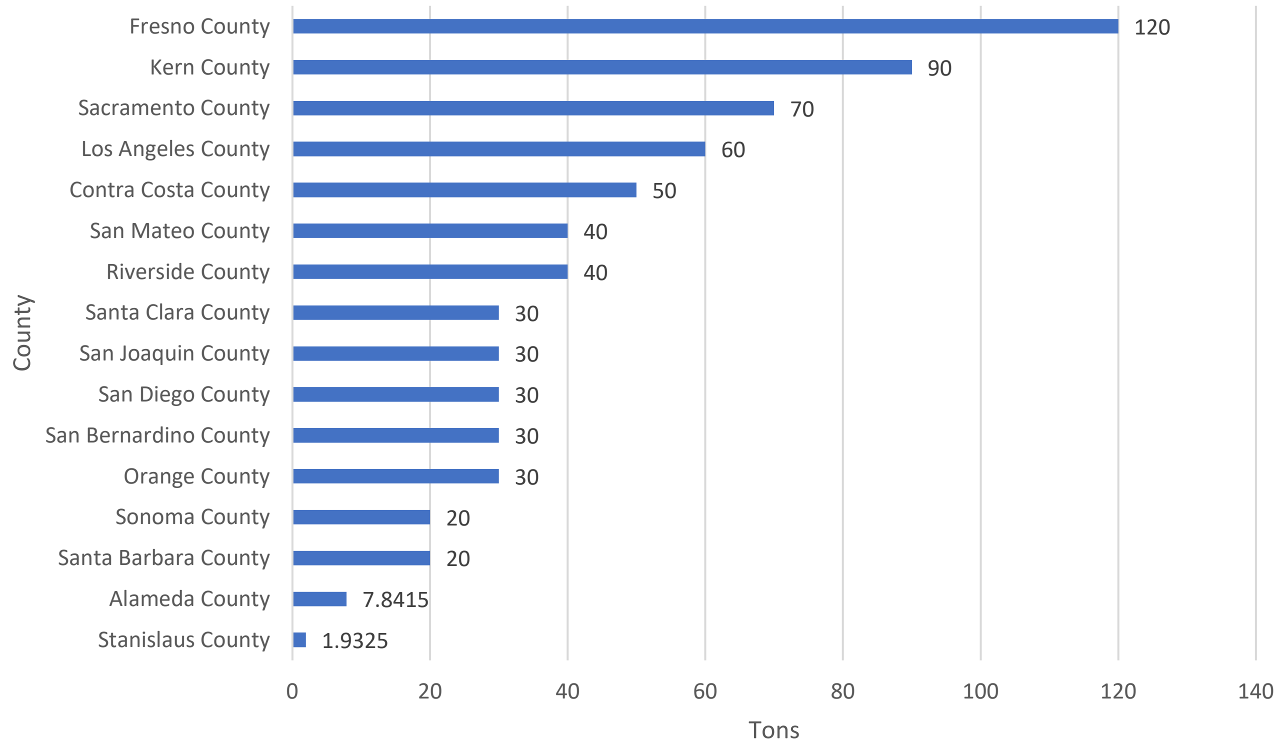

Figure 2.4-11: Handled PV Modules by County, Tons, 2021

For facilities reporting PV modules by count rather than by weight, handlers in California handled about 340 modules in 2021. Handlers in Los Angeles County handled about 250 modules (74%), and handlers in Butte County handled about 80 modules (24%).

2.4.2 Household Hazardous Waste (HHW)

Household hazardous waste is hazardous waste generated by households and very small businesses.[81] Household hazardous waste collection allows for households and some small businesses to drop off their hazardous waste at a collection facility, which properly manages the hazardous waste.

Households have simplified hazardous waste requirements in order to allow for proper management of small quantities of hazardous waste. Households do not require an EPA ID number,[82] may transport up to 5 gallons or 50 pounds of hazardous waste to a HHW collection facility,[83] and do not require a manifest when transporting hazardous waste to a HHW collection facility.[84]

[81] A "small business" would be considered a conditionally exempt small quantity generator (CESQG). California did not adopt the Code Fed. Regs., tit. 40, § 261.5 conditional exemption for smaller quantity generators.

[82] Cal. Code Regs., tit. 22, § 66262.12

[83] HSC § 25218-5.1

[84] HSC § 25218

Public agencies responsible for household hazardous waste management report collection data to the Department of Resources Recycling and Recovery (CalRecycle).[85] Public agencies use CalRecycle's Form 303 to submit their data.[86] Household hazardous waste collection and disposition information is available on CalRecycle's household hazardous waste website.[87]

Household hazardous waste collection data is not combined with data from other sections in this Report, such as electronic devices, because facilities may submit their handled waste in multiple databases. While some household waste appears in HWTS under State Waste Code 612, HWTS does not have the same level of detail that is available with CalRecycle's Form 303 data. CalRecycle's Form 303also captures a larger quantity of household hazardous waste than HWTS because HWTS only captures manifested waste.

2.4.2.1 Handled Household Hazardous Waste

Approximately 65,020 tons of household hazardous waste was collected in California in the 2020-2021 reporting period. Facilities in Plumas County, Mendocino County, and Colusa County did not report any HHW collection for 2020-2021. According to a representative of CalRecycle, this may have been due to COVID-19-related staffing shortages, or collection may have occurred in a different county. Some facilities collected waste for multiple counties, so these counties are reported together.

Figure 2.5-1 shows the handled HHW by county in California in 2020-2021 in tons. 65,020 tons of HHW was collected in the 2020-2021 reporting period. Los Angeles County handlers reported the most collected HHW at 14,850 tons (23%), followed by Orange County collectors at 5,820 tons (9%) and Alameda County collectors at 3,240 tons (5%). Universal waste constituted 33,350 tons (51%) of the total HHW collected. Table 2.5--1 shows handled HHW by county in 2020-2021 in tons.

[85] Cal. Code Regs., tit. 14, § 18751.2
[86] Cal. Code Regs., tit. 14, § 18751.1
[87] https://calrecycle.ca.gov/homehazwaste/reporting/

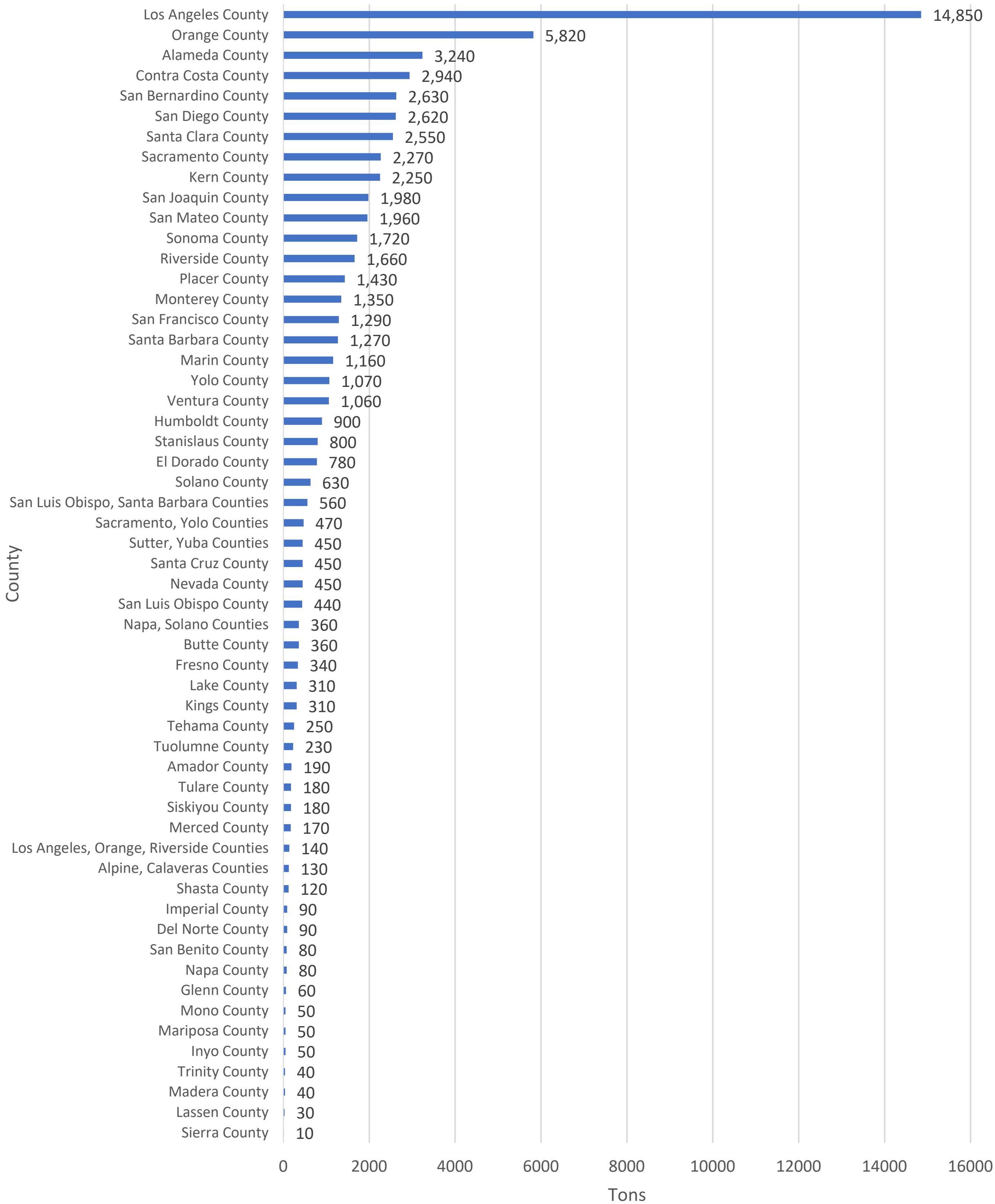
Los Angeles County
Orange County
Alameda County
Contra Costa County
San Bernardino County
San Diego County
Santa Clara County
Sacramento County
Kern County
San Joaquin County
San Mateo County
Sonoma County
Riverside County
Placer County
Monterey County
San Francisco County
Santa Barbara County
Marin County
Yolo County
Ventura County
Humboldt County
Stanislaus County
El Dorado County
Solano County
San Luis Obispo, Santa Barbara Counties
Sacramento, Yolo Counties
Sutter, Yuba Counties
Santa Cruz County
Nevada County
San Luis Obispo County
Napa, Solano Counties
Butte County
Fresno County
Lake County
Kings County
Tehama County
Tuolumne County
Amador County
Tulare County
Siskiyou County
Merced County
Los Angeles, Orange, Riverside Counties
Alpine, Calaveras Counties
Shasta County
Imperial County
Del Norte County
San Benito County
Napa County
Glenn County
Mono County
Mariposa County
Inyo County
Trinity County
Madera County
Lassen County
Sierra County
14,850
5,820
3,240
2,940
2,630
2,620
2,550
2,270
2,250
1,980
1,960
1,720
1,660
1,430
1,350
1,290
1,270
1,160
1,070
1,060
900
800
780
630
560
470
450
450
450
440
360
360
340
310
310
250
230
190
180
180
170
140
130
120
90
90
80
80
60
50
50
50
40
40
30
10
County
0
2000
4000
6000
8000
10000
12000
14000
16000
Tons

Figure 2.5-12: Handled HHW by County, Tons, 2020-2021

Figure 2.5-2 shows handled HHW by category in the 2020-2021 reporting period in tons. About 65,020 tons of HHW was collected in 2020-2021. Electronic devices, which are a type of universal waste, were the most-collected type of HHW at 29,320 tons (45%). Other types of universal waste represented 4,030 tons (6%). Reclaimable[88] materials, which are materials processed to recover usable products or regenerated, represented 15,660 tons (24%). Table 2.5-2 shows handled HHW by category in 2020-2021 in tons.

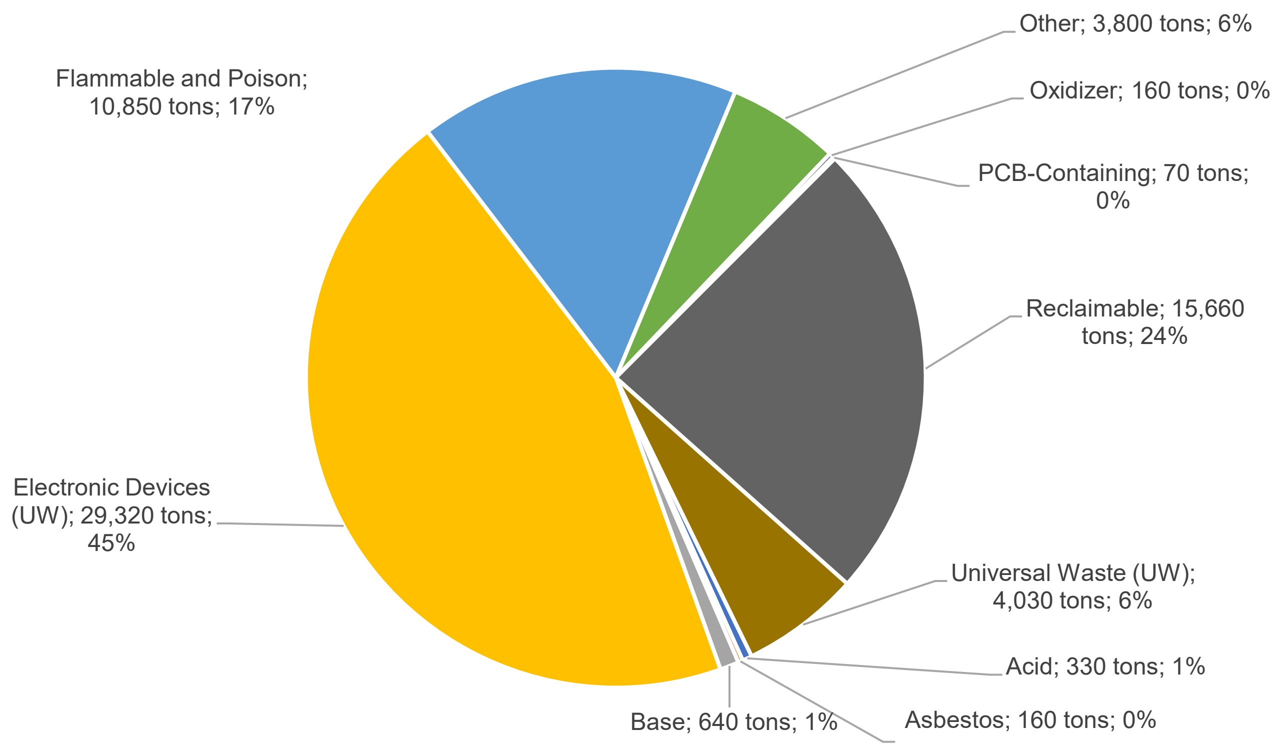

Figure 2.5-13: Handled HHW by Category, Tons, 2020-2021

Figure 2.5-3 shows handled universal waste collected through HHW collection programs in California by category in 2020-2021 in tons. Approximately 33,350 tons of universal waste was collected by HHW collection programs. Universal waste represented 51 percent of the collected HHW. Table 2.5-3 shows handled Universal Waste collected through HHW collection programs by category in tons in 2020-2021.

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[88] Cal. Code Regs., tit. 22, § 66260.10

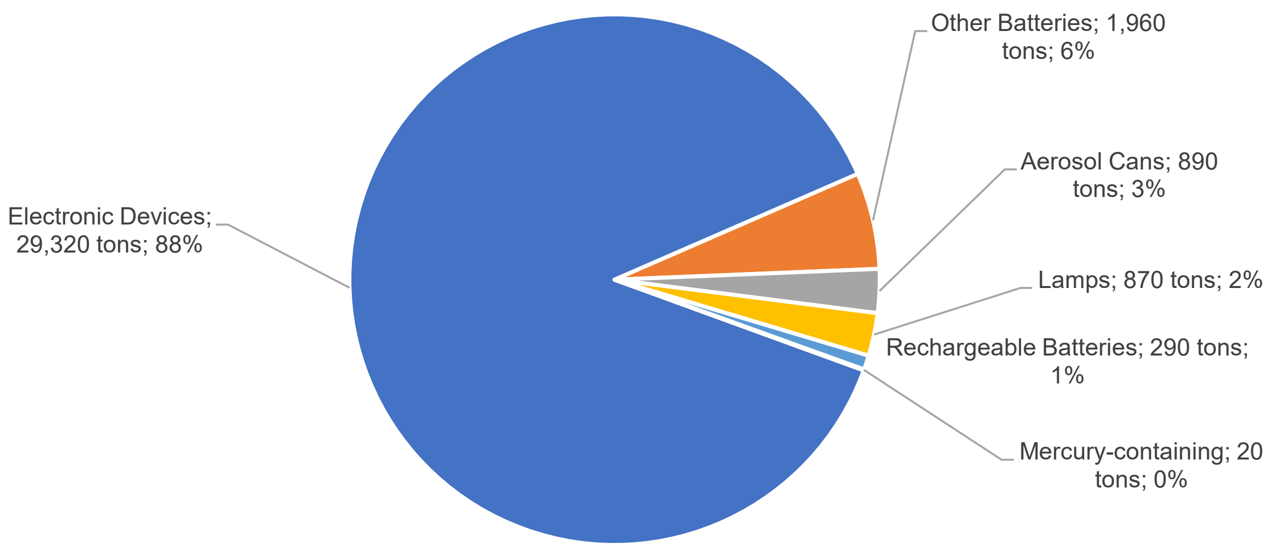

Figure 2.5-14: Handled Universal Waste Through HHW Collection, Tons, 2020-2021.

HHW collection includes collection data for aerosol cans and lamps, which are two universal waste types that do not have available quantity information. Aerosol can collection made up about 890 tons (3%) of the universal waste portion of HHW collection and about one percent of the total HHW collected in 2020-2021. Lamp collection represented about 870 tons (2%) of the universal waste portion of HHW collection and about one percent of the total HHW collected in 2020-2021.

Electronic devices made up about 29,320 tons (88%) of the universal waste portion of HHW collection and about 45 percent of the total HHW collected in the 2020-2021 reporting period.

Less than one ton of PV modules were collected through HHW collection.

Figure 2.5-4 shows handled reclaimables[89] collected through HHW collection programs in 2020-2021 in tons. With about 15,660 tons collected, reclaimables represented 24 percent of the total. Latex paint was the most-collected reclaimable at 11,790 tons (75%). This represented 18 percent of the total HHW collected. Motor oil and products were the second most-collected reclaimable at 1,970 tons (13%) and represented three percent of the total HHW collected. Auto-type batteries constituted about 1,230 tons

[89] Materials that are processed to recover a usable product or are regenerated.

(8%) and represented two percent of the total HHW collected. Used oil filters were the least-collected reclaimable in the 2020-2021 reporting period at 130 tons (1%). Table 2.5-4 shows handled reclaimables by type collected through HHW collection programs in 2020-2021 in tons.

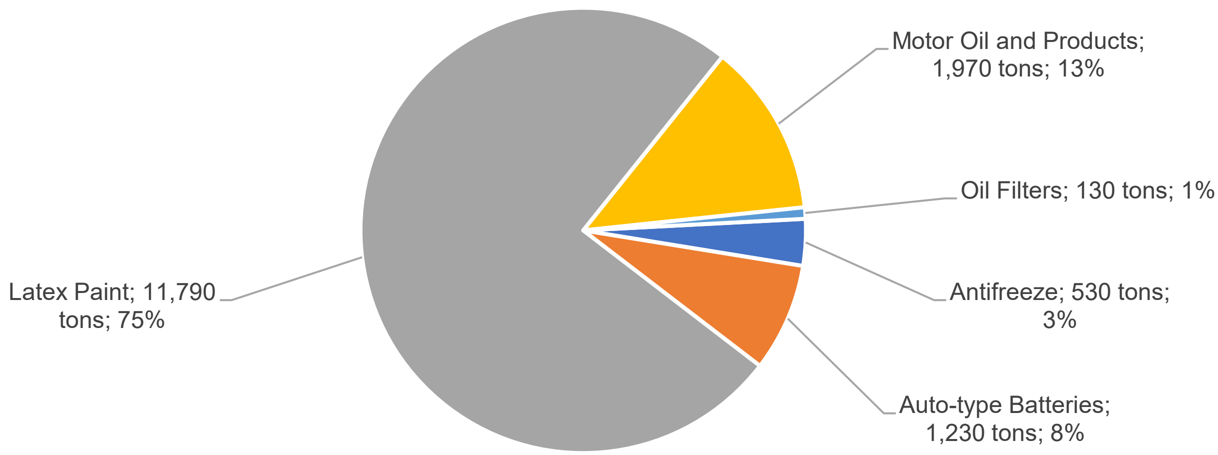

Figure 2.5-15: Handled Reclaimables Through HHW Collection, Tons, 2020-2021

2.4.3 Treated Wood Waste

Treated wood is wood that has gone through a treatment process with chemical preservatives to protect the wood against pests and environmental conditions. Preservatives used to treat wood may include arsenic, chromium, copper, pentachlorophenol, and creosote.[90]

Non-RCRA hazardous treated wood waste has alternative management standards designed to encourage safe and economical disposal. These alternative standards include lessened storage requirements and extended accumulation periods. They also allow treated wood waste to be shipped without a hazardous waste manifest and a hazardous waste hauler, and they allow for disposal at specific non-hazardous waste landfills.

These alternative management standards were briefly abolished between December 31, 2020, and August 31, 2021, due to a veto of Senate Bill 68 in 2020. The lapse in standards created issues for generators, homeowners, landfills, and DTSC. Generators of treated wood waste had to arrange for Class I disposal or find alternatives , likely increasing their costs. During this lapse, DTSC granted variances allowing applicants to

[90] "Treated Wood Waste (TWW)." *Dtsc.ca.gov*, State of California, Website Link.

dispose of treated wood waste in certain landfills. This created burdens for generators and DTSC alike including resource impacts and disposal delays. The lapse in alternative management standards also created concerns about illegal dumping because landfills no longer accepted treated wood waste. The passage of Assembly Bill 332 in 2021 restored the alternative management standards, eliminating the need for variances and the associated DTSC workload.

Treated wood waste facilities and landfills that accept treated wood waste submit semiannual reports to DTSC using the Treated Wood Waste Tracking System. DTSC makes the information in the submitted semiannual reports available to the public, with the exception that "the Department shall not disclose the association between any specific treated wood waste handlers and specific facilities. The list of treated wood waste handlers served by a facility shall be deemed to be a trade secret and confidential business information."[91] Because of this, handler information for treated wood waste is not available for this Report.

Generated treated wood waste that is tracked by a manifest can be found in the Hazardous Waste Tracking System (HWTS) using State Waste Code 614 and is discussed in section 2.1, Manifested Waste. This is likely an underestimate of the amount of generated treated wood waste because treated wood waste does not require a manifest, and HWTS does not track unmanifested hazardous waste.

2.4.4 Used Oil Filters

Used oil filters are considered a non-RCRA hazardous waste because they may contain lead, other heavy metals, and petroleum derived compounds. DTSC adopted reduced handling requirements in order to encourage recycling of drained used oil filters. If they are not sent for recycling, used oil filters are a hazardous waste and must be managed as a fully regulated hazardous waste.[92]

An estimate of the quantity of used oil filters generated annually is not available. However, CalRecycle's Form 303 data includes some of this quantity under its "Reclaimables" category. Generation data for reclaimable material recorded through Form 303 is in section 2.5.1.1, Handled Household Hazardous Waste.

[91] HSC § 25173 and Cal. Code Regs., tit. 22, § 66260.2
[92] "Managing Used Oil Filters for Generators." *Dtsc.ca.gov*, State of California, Nov. 2008, Website Link.

2.4.5 Discussion

One of the most important steps in the management of hazardous waste is proper identification of hazardous waste. First, it must be determined whether a material is actually waste or is a material that could be used for another purpose or recycled. Then it must be determined whether the waste is excluded from classification as a hazardous waste or exempt from management as a hazardous waste. If the waste is not excluded or exempt, it must be determined whether it is identified as hazardous because it exhibits a characteristic of a hazardous waste or appears on an authoritative list of hazardous wastes. Making these determinations is a very complex task.

The individual or entity that generated the waste is responsible for making these determinations because that entity is most knowledgeable about the waste and is in the best position to make an accurate identification. Once a waste is determined to be a hazardous waste, the entity that generated it is then responsible for ensuring the waste is managed appropriately as a hazardous waste.

2.4.5.1 Waste Reduction Efforts

Hazardous waste management follows a general hierarchy, with source reduction as the highest priority, followed by recycling and reuse, treatment, and disposal. Source reduction prevents hazardous waste from being generated in the first place.

This Report does not attempt to quantify the amount of source reduction that occurs in California. However, historical information from past source reduction efforts provides some evidence for the amount of source reduction occurring in California. More current information may be available in databases like the U.S. EPA Toxic Release Inventory (TRI), and DTSC recommends conducting research in this area in the future. However, TRI and other databases do no separate hazardous wastes from other types of waste. As a result, it is challenging to quantify the information related specifically to hazardous waste source reduction.

This Report also considers the roles that waste treatment and recycling/reuse can play in waste reduction. In general, treatment and recycling reduce the quantity of waste that is identified as hazardous; however, it is challenging to gather reliable information on any resulting waste reduction. To some extent this information can be found in CERS, but it is challenging to separate what would be considered hazardous wastes from other types of waste. An ongoing DTSC review of generator treatment and recycling activities demonstrates that a large quantity of waste is treated and recycled in California. The review estimates that at least 2.7 billion gallons of California waste was recycled or treated on site in 2021,which equates to an estimated 11 million tons. This is a significant quantity when compared to the less than two million tons of hazardous that is manifested annually.

Hazardous waste recycling and treatment can either occur at the location where it is generated (on site) or off site. Off-site treatment occurs at hazardous waste management facilities like permitted treatment, storage, and disposal facilities (TSDFs) and is discussed further in Section 3 of this Report. Research regarding the amount of waste treated and recycled on site is ongoing. As of May 2023, DTSC had completed review of about one-third of the generators that indicated they had treated or recycled waste on site in 2021.

DTSC recommends exploring additional opportunities for decreasing the amount of hazardous waste shipped offsite through source reduction, on-site recycling, and on-site treatment. A potential area of future work for the Plan to consider is a review of California's requirements for on site waste treatment, as well as the exclusions that exist for waste recycling and reuse. Review of these items will help determine where current requirements may limit the amount of waste that necessitates shipments of these wastes to TSDFs.

2.4.5.2 Considerations for Waste Stream Prioritization of Manifested Hazardous Waste

Because waste streams vary greatly, prioritizing reductions in some waste streams will likely have a greater impact than others. There are many factors to consider, including the sheer size of a waste stream, a waste stream's impact to human health and/or the environment, and the viability of reduction efforts.

The impact on the overall quantity of hazardous waste may not be the most appropriate consideration in prioritizing a waste stream for reduction. Rather, it may be more appropriate to prioritize a smaller waste steam that has a greater impact on human health or the environment. Alternately, a waste stream may not be appropriate for prioritization if reductions are physically impossible, economically unfeasible, or are already being accomplished.

Approximately 21 million tons of manifested hazardous waste were generated in California from January 2010 to May 2022. About 19 percent of that (3.8 million tons) was RCRA hazardous waste, while about 81 percent (17 million tons) was considered hazardous in California but not under RCRA.

The three largest waste streams make up 65 percent of the hazardous waste generated in California since 2010 – contaminated soil, waste oil and mixed oil, and other inorganic solids. Waste oil and mixed oil already constitute one of the most recycled waste streams, and the amount generated is likely to decrease over time because of the transition to electric vehicles. Recycling of this waste stream is discussed further in Section 3.1.1.2 of this Report.

In contrast, contaminated soil is not recycled, and certain constituents are extremely difficult to remove. Preliminary research indicates that lead and other metals are the primary constituents that cause a significant amount of soil to be identified as hazardous. These generally occur in low concentrations are. Given the characteristics of these constituents and the additional processing that would be required to reduce the volume of this waste stream, the benefits of such a reduction are unclear.

A significantly smaller waste stream, such as organic solvents, might be an appropriate target for waste reduction; however the impact on the overall quantity of waste generated may be limited. Research conducted for this Report estimates this waste stream accounts for roughly four percent of hazardous waste generated in California since 2010. Even a significant 50 percent reduction in this waste stream would only result in a two percent overall reduction in hazardous waste generation. However, this smaller waste stream could still be an appropriate target for reduction because it may have a larger potential to impact human health and the environment than soil contaminated with low concentrations of metals.

2.4.5.3 Considerations for Waste Stream Prioritization of Unmanifested Waste

Unlike manifested waste, it may not be advantageous to reduce some unmanifested waste, like Universal Waste. These are hazardous wastes that are subject to less-stringent regulatory requirements in order to encourage Californians to manage them properly. Reducing this waste stream is not a goal, as an increase in the amount of these items that are managed properly represents a decrease in the amount that would be disposed of in a municipal landfill or otherwise managed improperly.

Information on the amounts and types of universal waste managed in California is limited, but efforts to quantify and track these wastes could operate against the purpose of the reduced regulatory requirements. Data on one type of unmanifested waste – universal waste – is found in a variety of sources, including DTSC annual reports, surveys, and third-party reports. These sources are not systems for tracking waste from cradle to grave but are designed as notification systems. Efforts to gather more information must be balanced against the additional requirements these efforts may impose. For example, incorporating a tracking system like the Uniform Manifest would require additional process steps, which may deter people from managing these wastes properly.

Efforts to collect unmanifested waste, including universal waste and household hazardous waste should be encouraged in order to continue to promote proper management of these wastes.

2.4.5.4 Consideration of Waste Generation and Certified Unified Program Agencies

While DTSC always has the authority to inspect and enforce the regulations at a generator location, the 81 CUPAs and Participating Agencies conduct the generator inspections. These Certified Unified Program Agencies (CUPAs) manage 100,000 generators of waste, implement five other environmental programs and have access to data that may help resolve certain gaps in information presented in this Report. DTSC will be engaging with the CUPAs during future planning efforts.

Department of Toxic Substances Control

CalEPA
California Environmental Protection Agency

Draft Hazardous Waste Management Report

Implementation of California Health and Safety Code Section 25135

Section 3

3. Destinations of Hazardous Waste

For this Report, the term *destination facility* refers to all destinations of hazardous waste.[1] This may include, but not be limited to, recyclers, treatment facilities, disposal facilities, and many out-of-state non-hazardous waste landfills.[2] Hazardous wastes are sent to these facilities for recycling, treatment, and/or disposal.

Central to the management of hazardous waste is land disposal. If a hazardous waste cannot be recovered, treated, or recycled, it must be disposed of in an adequately designed land disposal unit (i.e., land treatment unit, landfill, surface impoundment, or waste pile). Prior to RCRA, disposal of hazardous waste in the land (e.g., buried in a landfill) was completed in a way that led to damage to human health and the environment, such as contamination of groundwater. The RCRA program established extensive technical requirements to ensure that land-based units prevent hazardous leachate from leaking into the environment.[3] Like RCRA, California's program for hazardous waste management includes specific design requirements for land disposal units.

In 1984, the United States Congress added the Hazardous and Solid Waste Amendments (HSWA) to the RCRA program. HSWA established the authority for the Land Disposal Restriction (LDR) program, which complements RCRA's technical design requirements and adds three prohibitions – disposal, dilution, and storage.[4] The disposal prohibition is one of the primary elements of the LDR program, requiring that hazardous wastes be treated before they are disposed of to a hazardous waste landfill. Properly treated hazardous wastes pose less of a risk to groundwater, surface water, and air, because treatment reduces characteristics like toxicity by destroying or removing the harmful constituents. Treatment also reduces the mobility of harmful constituents.

While land disposal is central to safe hazardous waste management, it may not be the preferred management method. In developing the Hazardous Waste Management Plan, DTSC will review and analyze waste management in California to identify additional opportunities to better support and apply the waste management hierarchy.[5]

The information in this section relates to the destinations of both manifested and unmanifested hazardous wastes.

[1] HSC § 25135(b)(2)(B)

[2] Many States do not recognize non-RCRA hazardous wastes coming from other States to be hazardous in their State. Therefore, many non-RCRA wastes are typically not required to be disposed in a hazardous waste landfill.

[3] U.S. EPA RCRA Orientation Manual 2014

[4] U.S. EPA website regarding Land Disposal Restrictions for Hazardous Waste.

[5] https://www.epa.gov/sites/default/files/2016-01/documents/review_of_several_state_planning_approaches.pdf

3.1 Manifested Waste

In accordance with HSC § 25135(b)(1), this section includes available information and discussion about hazardous waste streams currently being managed either in California or in other states. In addition, this section presents information for the following elements:

- The destination to which each hazardous waste stream is shipped
- The amount of hazardous waste disposed to land in California and other states
- The amount of hazardous waste treated in California and other states
- The amount of hazardous waste regulated under RCRA
- The amount of hazardous waste regulated only in California

The numerous sources used to compile the required information are discussed in the relevant subsections below. The primary source of information for manifested hazardous waste in this Report is DTSC's Hazardous Waste Tracking System (HWTS), which uses data from hazardous waste manifests. This Report incorporates adjusted HWTS data from 2010 through May 2022.

Since 1983, the number of hazardous waste facilities in California with an operating hazardous waste management permit has decreased. Figure 3.1-1 shows the decrease from more than 400 facilities to fewer than 100 still in operation.

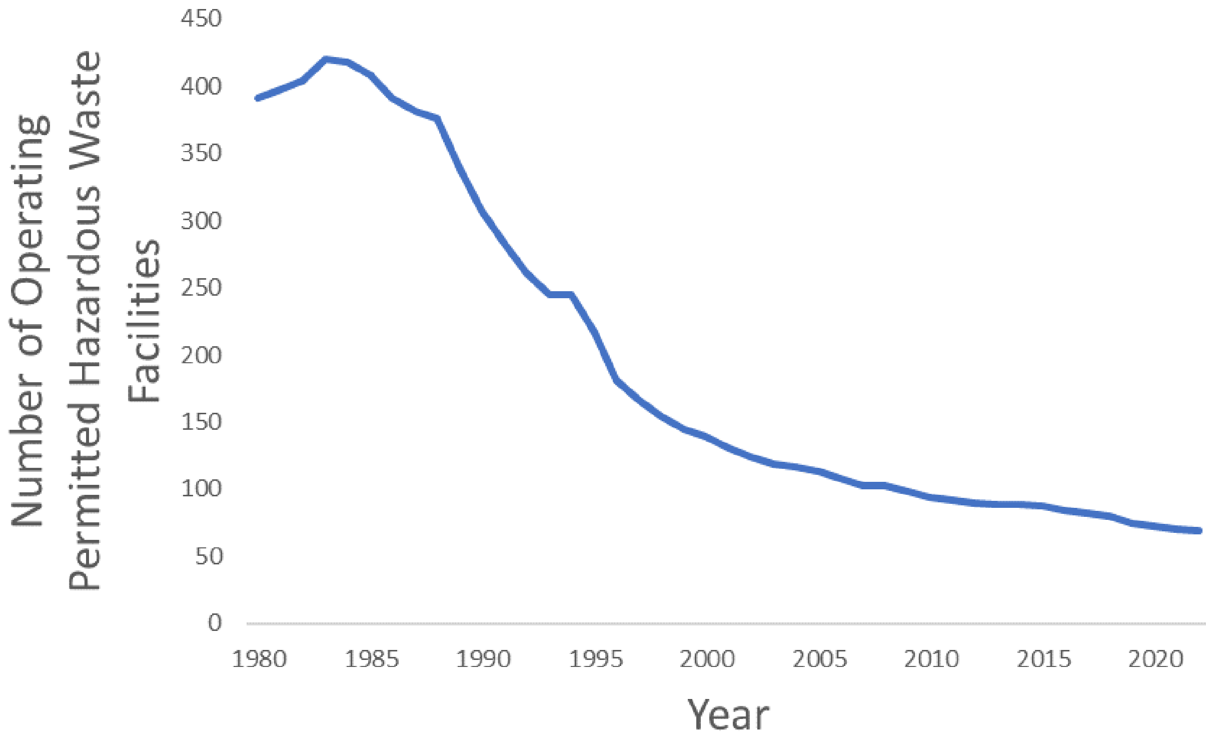

Figure 3.1-1: Number of California Hazardous Waste Facilities in Operation

Similarly, the number of destination facilities that receive California's manifested hazardous waste has also decreased, as shown in Figure 3.1-2. This trend includes both in-state and out-of-state destination facilities. There are two likely causes behind this trend. One is the additional hazardous waste facility siting and permitting requirements California has enacted. Another likely cause is a national consolidation and restructuring within the hazardous waste management industry, which has been observed by U.S. EPA.

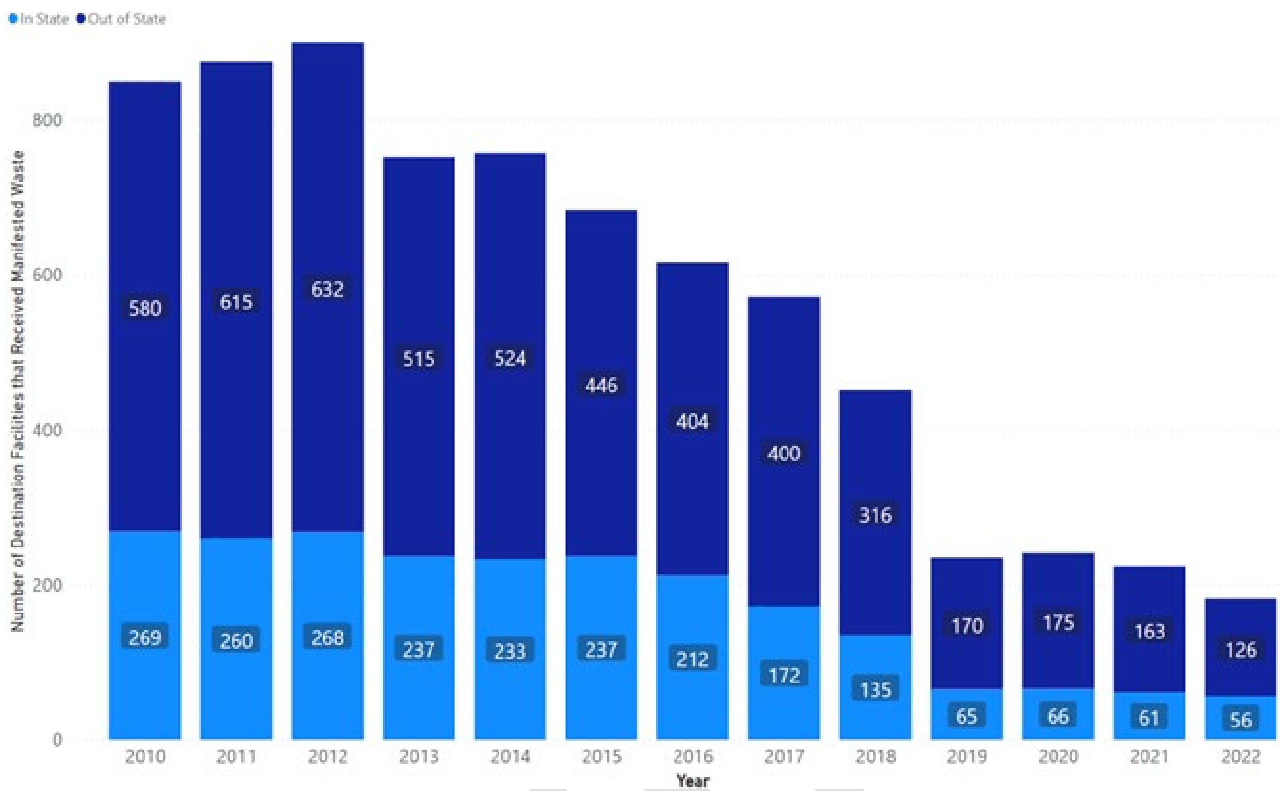

Figure 3.1-2: Number of Distinct EPA ID Numbers Managing Manifested Hazardous Waste (January 2010 to May 2022)

Since 2010, California generated 21.05 million tons of manifested hazardous waste. Once hazardous waste is generated, it needs to be properly managed. Table 3.1-1 provides an annual breakdown of the quantity of manifested hazardous waste in California, the quantity managed in California, and the quantity managed out of state.

Table 3.1-1: Annual Breakdown of California's Manifested Waste: Manifested in California, Managed in California, and Managed Out of State from 2010-2022

Year	Quantity Manifested in California	Quantity Managed in California (Tons)	Quantity Managed in California (Percent)	Quantity Managed Out of State (Tons)	Quantity Managed Out of State (Percent)
2010	1,749,712	1,091,641	62%	658,071	38%
2011	1,790,019	934,786	52%	855,233	48%
2012	1,626,602	903,121	56%	723,481	44%
2013	1,532,005	804,325	53%	727,680	47%
2014	1,663,601	839,639	50%	823,962	50%
2015	1,746,462	921,003	53%	825,459	47%
2016	1,784,320	1,032,100	58%	752,220	42%
2017	1,968,877	950,161	48%	1,018,716	52%
2018	1,982,133	1,037,403	52%	944,730	48%
2019	1,805,200	902,662	50%	902,538	50%
2020	1,565,685	826,963	53%	738,722	47%
2021	1,413,212	731,908	52%	681,305	48%
2022	423,275	229,667	54%	193,608	46%

To understand how manifested hazardous waste is being managed, hazardous waste manifests and HWTS use Management Method Codes to describe the type of management system used to treat, recover, or dispose of the waste.

Land disposal[6] has been one of the most common waste management methods in the United States, and it is the most common method for managing hazardous waste generated in California. Since 2010, 59.2 percent of the manifested hazardous waste generated in California (12.5 million tons) has been disposed of in a land disposal unit (Management Method Code: H132).

The second most common hazardous waste management method is "other recovery or reclamation for reuse" (Management Method Code: H039), which comprises 24.2 percent of the total (5.09 million tons). Incineration (Management Method Code: H040) is the third most common method; however, it has only been used for 2.31 percent of the hazardous waste managed since 2010 (620,000 tons). Figure 3.1-3 shows how California's hazardous waste is being managed at destination facilities.

[6] Cal. Code Regs., tit. 22, § 66260.10

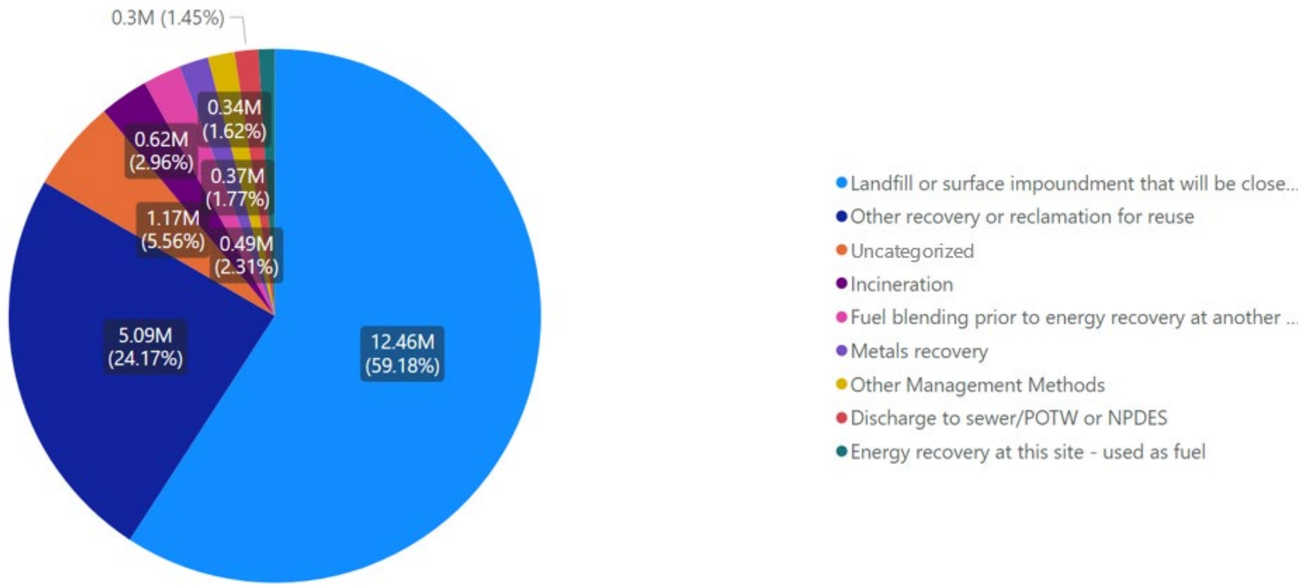

Figure 3.1-3: Quantity of Hazardous Waste per Management Method (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

3.1.1 Management of California’s Manifested Hazardous Waste In State

Since 2010, California generators have shipped 21.05 million tons of manifested hazardous waste. Due to several factors, not all hazardous waste generated in California is managed[7] within California. Since 2010, 53.2 percent of manifested hazardous waste has been managed within the state (11.21 million tons). The remaining 46.8 percent (9.85 million tons) was managed outside the state. Figure 3.1-4 shows the amount of manifested hazardous waste managed within California each year since 2010.

[7] Treated, recycled, or disposed at a destination facility.

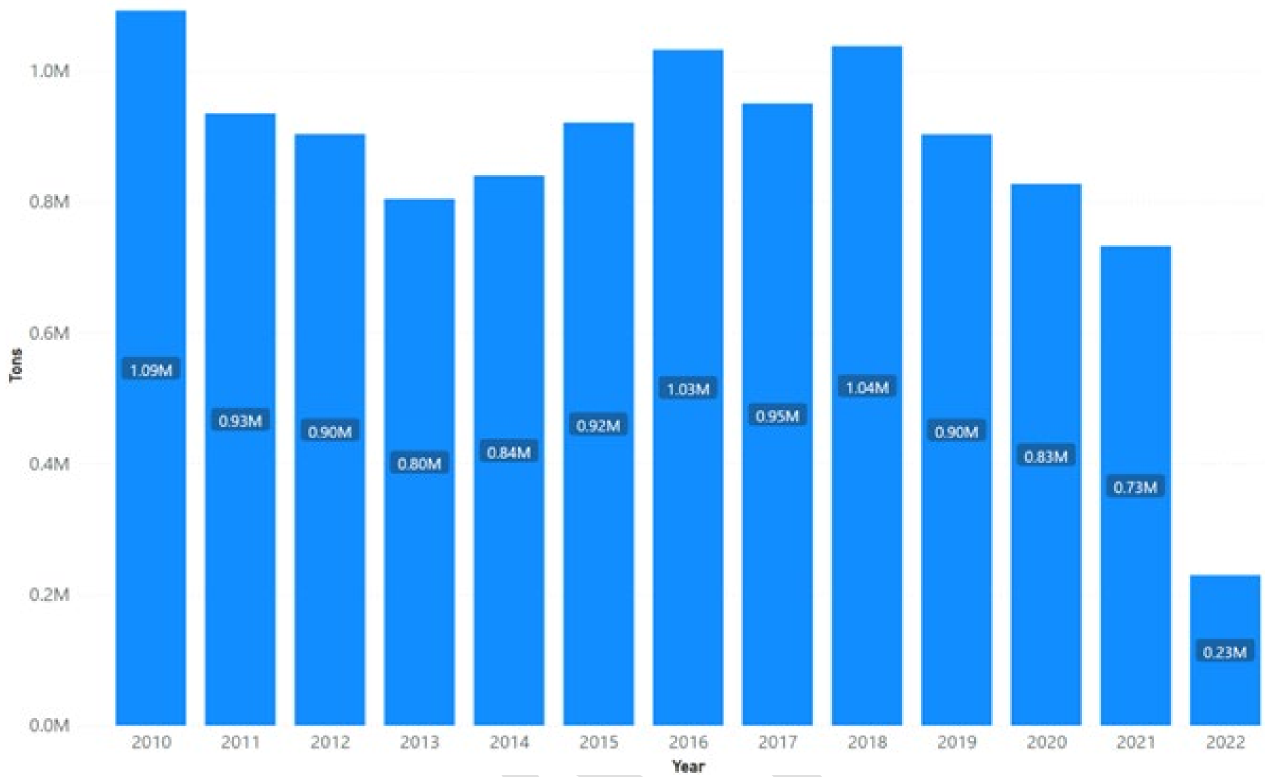

Figure 3.1-4: Amount of Manifested Hazardous Waste Managed within California (January 2010 to May 2022)

Since 2010, 86.1 percent of the manifested hazardous waste managed within California has been non-RCRA hazardous waste (9.65 million tons), and 12.9 percent (1.45 million tons) has been RCRA hazardous waste, as shown in Figure 3.1-5.

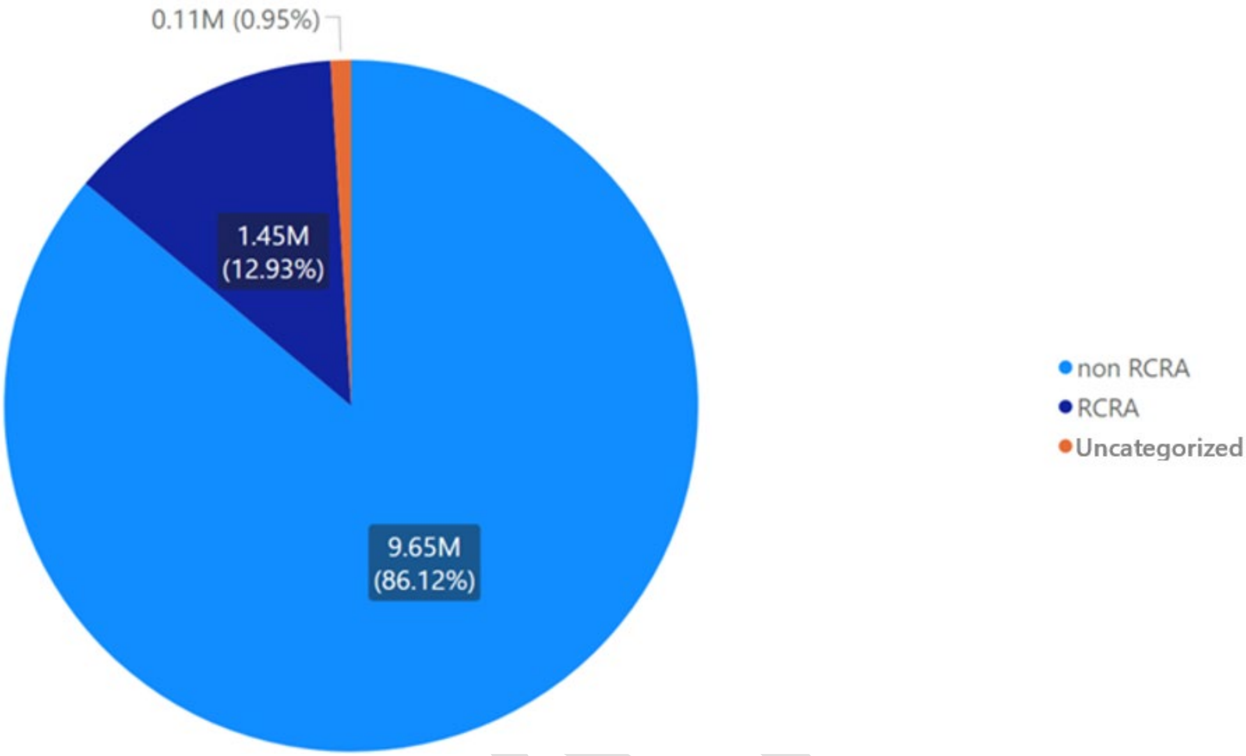

Figure 3.1-5: RCRA and Non-RCRA Manifested Hazardous Waste Managed within California, tons (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

As mentioned in Section 2.1.6, California's Largest Hazardous Waste Streams, three waste streams have consistently been the largest by weight since 2010. The largest waste stream generated in California each year is Contaminated Soil from Site Cleanups (State Waste Code 611). The second largest is Waste Oil and Mixed Oil (State Waste Code 221). The third largest is Other Inorganic Solids (State Waste Code 181). Since 2010, these three waste streams have accounted for 64.8 percent of the total waste generated, or 13,651,300 tons.

3.1.1.1 Contaminated Soil from Site Cleanups

California has generated more Contaminated Soil from Site Cleanups (contaminated soil) than any other waste stream since 2010 – on average, more than 567,000 tons each year (Figure 3.1-6). Just under half of California's contaminated soil has been managed in California. Since 2010, 3.13 million tons (43.9%) of contaminated soil have been managed in California, while 4.00 million tons (56.1%) has been managed out of state. The annual quantity of contaminated soil managed within California can be seen in Figure 3.1-6.

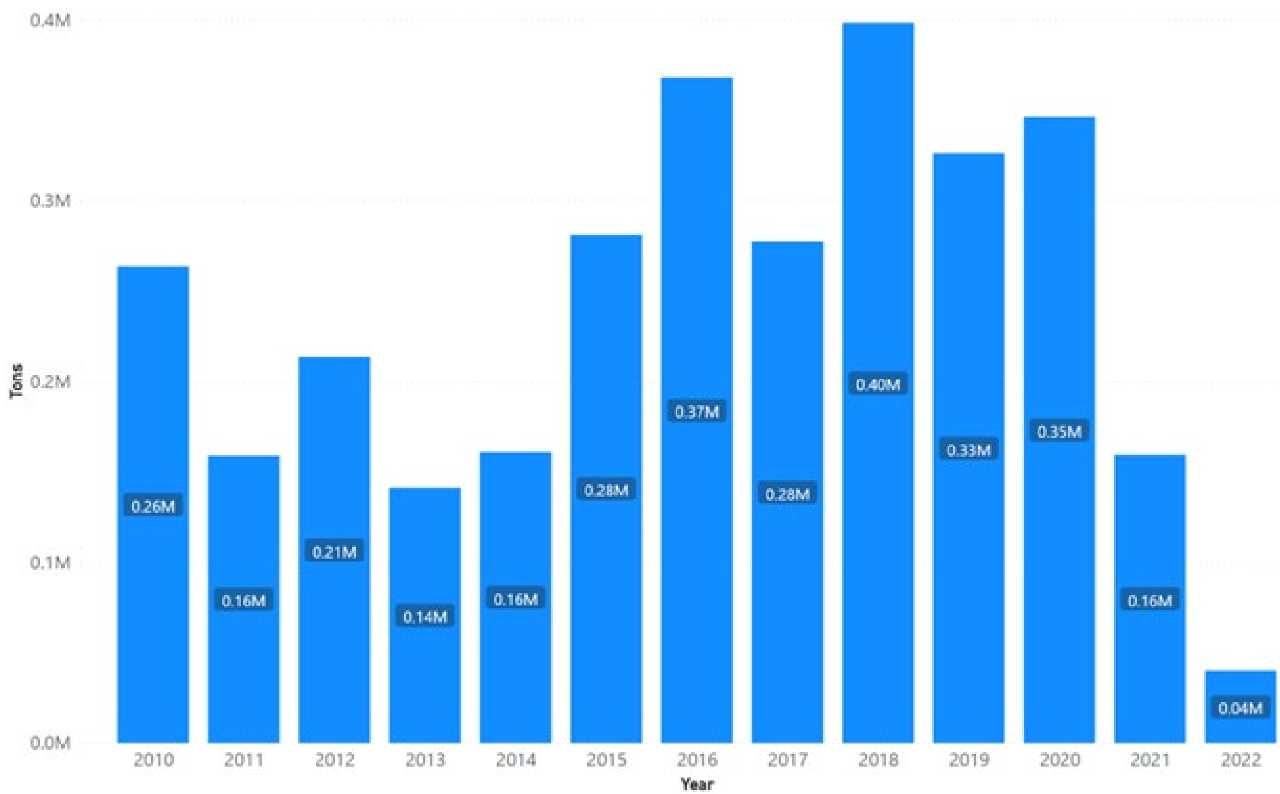

Figure 3.1-6: Amount of Contaminated Soil Managed in California (January 2010 to May 2022)

Approximately 93 percent of the contaminated soil generated in California since 2010 has been non-RCRA hazardous waste (Figure 3.1-7).

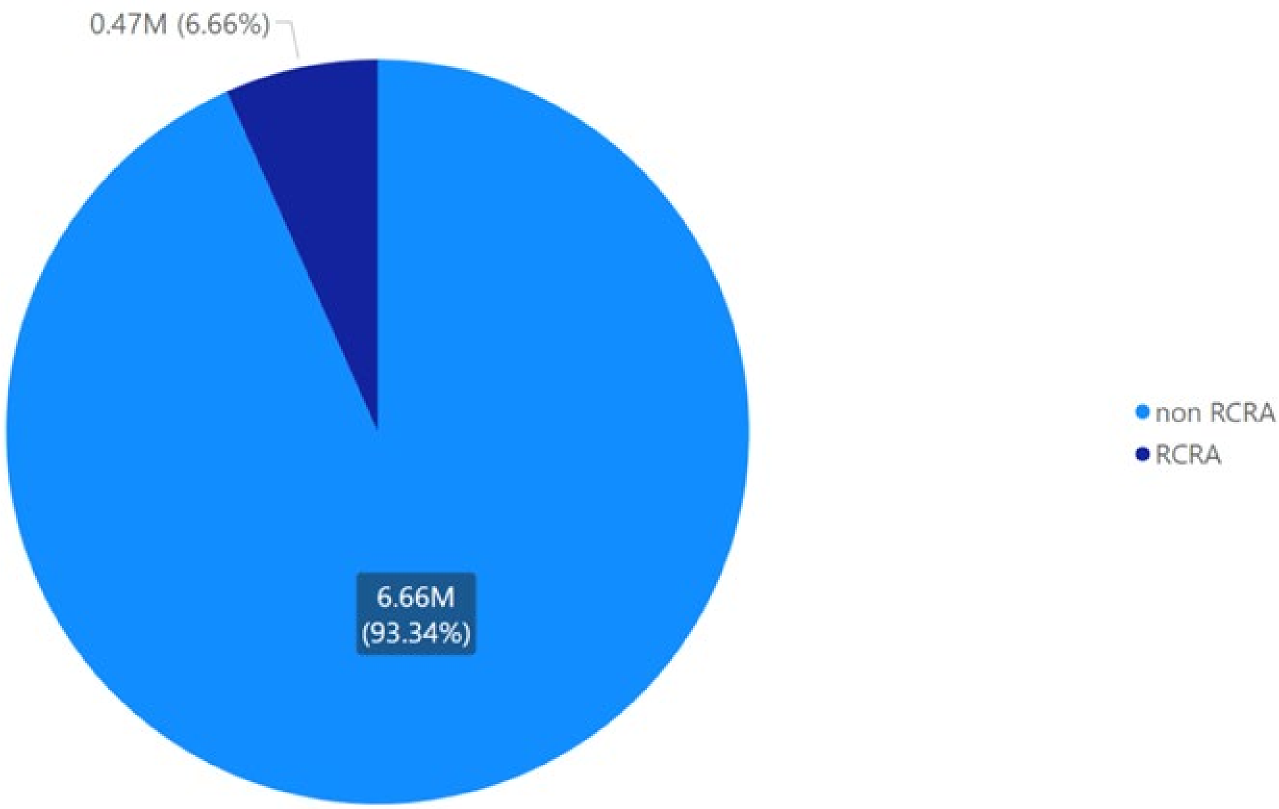

Figure 3.1-7: Amount of RCRA and Non-RCRA Contaminated Soil Generated in California (January 2010 to May 2022)

Since 2010, 99.9 percent of the contaminated soil disposed of within California has been disposed of within three locations:

- 2.10 million tons (66.9%) was disposed of at Clean Harbors Buttonwillow LLC.
- 0.978 million tons (31.2%) was disposed of at Chemical Waste Management Inc Kettleman.
- 58,400 tons (1.9%) was disposed of at Mecca Resources Facility.[8]

3.1.1.2 Waste Oil and Mixed Oil

Since 2010, California's second largest type of hazardous waste generated has been Waste Oil and Mixed Oil (waste oil). On average, California manifests more than 323,000 tons of waste oil each year.

The vast majority of California's waste oil is managed in California. Since 2010, 3.12 million tons (92.0%) has been managed in California compared to 0.269 million tons (7.95%) managed out of state. The annual quantity of waste oil managed within California can be seen in Figure 3.1-8.

[8] Western Environmental Incorporated, Mecca, California Community Notice, May 2014 (Weblink)

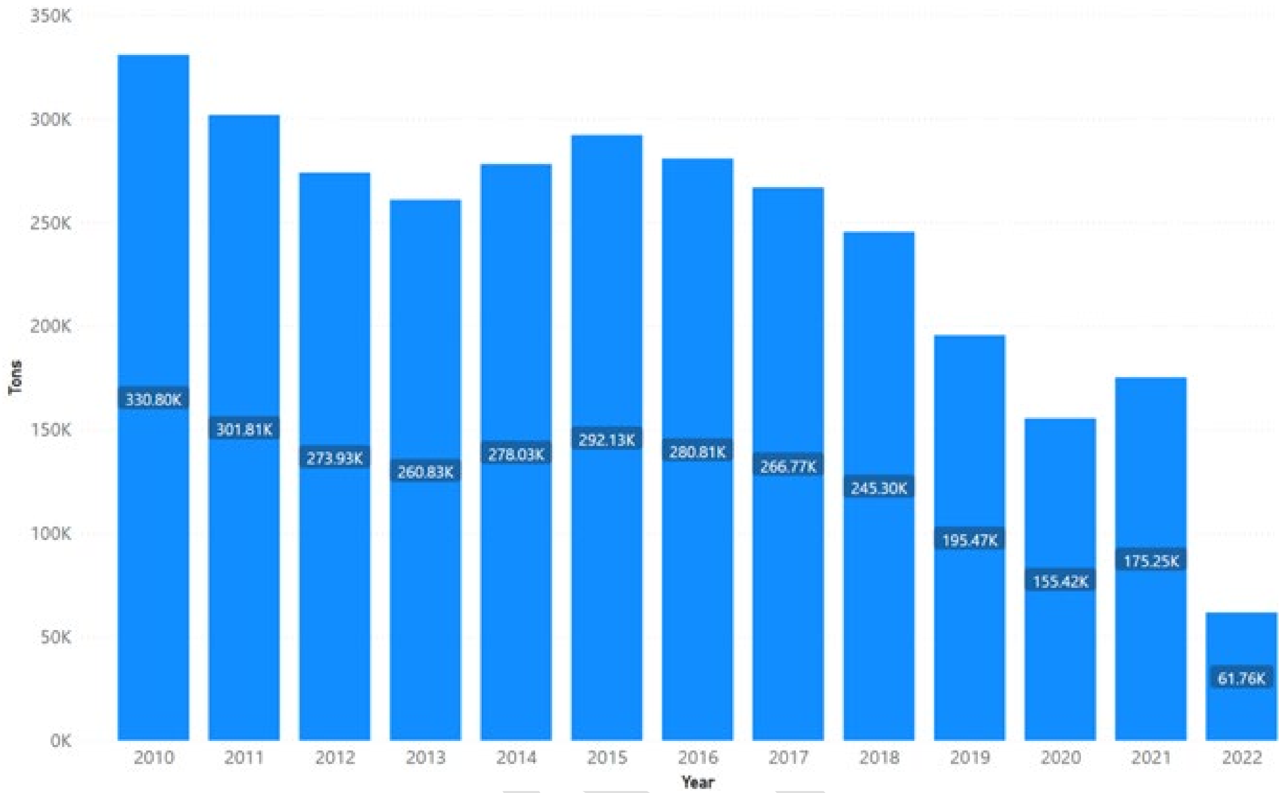

Figure 3.1-8: Quantity of Waste Oil Managed in California (January 2010 to May 2022)

Since 2010, more than 95.4 percent of the waste oil managed within California has been managed at four locations:

- 2.20 million tons (70.7%) was managed at Demenno-Kerdoon.
- 374,100 tons (12.0%) was managed at Safety-Kleen of California Inc.
- 200,700 tons (6.4%) was managed at Industrial Service Oil Co Inc.
- 194,200 tons (6.2%) was managed at Agritec INT DBA Cleantech Environmental Inc.

3.1.1.3 Other Inorganic Solid Waste

Since 2010, California's third largest type of hazardous waste generated has been Other Inorganic Solid Waste (inorganic solid waste). On average, California manifests more than 264,000 tons of inorganic solid waste each year, with just under half of it managed in California. Since 2010, 1.43 million tons (45.7%) of inorganic solid waste was managed in California while 1.70 million tons (54.3%) was managed out of state. The annual quantity of inorganic solid waste managed within California can be seen in Figure 3.1-9.

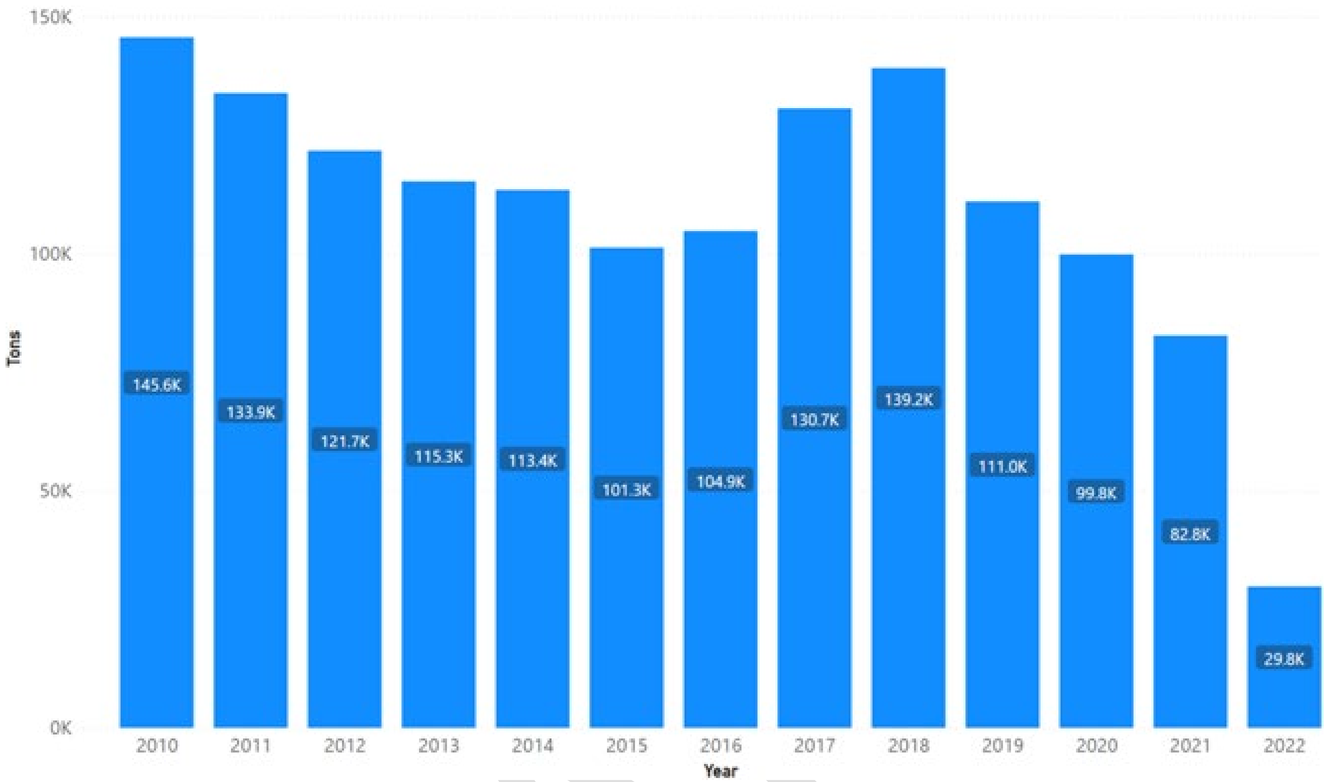

Figure 3.1-9: Quantity of Inorganic Solid Waste Managed in California (January 2010 to May 2022)

Since 2010, 98.5 percent of the inorganic solid waste managed within California was shipped to five locations:

- 822,600 tons (57.6%) was managed at Clean Harbors Buttonwillow LLC.
- 417,000 tons (29.2%) was managed at Chemical Waste Management Inc. Kettleman.
- 88,800 tons (6.2%) was managed at KW Plastics of California.
- 40,400 tons (2.8%) was managed at Quemetco Inc.
- 39,900 tons (2.8%) was managed at Exide Technologies Inc.

3.1.2 Management of California's Manifested Hazardous Waste in Other States

Since 2010, California has generated 21.05 million tons of manifested hazardous waste. Of that waste, 46.8 percent was managed outside California (9.85 million tons). The top three states that received the most manifested hazardous waste from California were:

- Utah – 3,158,000 tons (15.2%)
- Arizona – 2,839,400 tons (13.4%)
- Nevada – 2,169,400 tons (10.4%)

As discussed in Section 2.3.3, California's hazardous waste criteria are more stringent and broader in scope, which results in California identifying more wastes as hazardous than does RCRA. As such, California's manifested hazardous waste is organized into two categories: "RCRA hazardous waste" and "non-RCRA hazardous waste."

Non-RCRA hazardous waste generated in California is typically required to be managed as hazardous waste within California.[9] Many states do not consider non-RCRA hazardous waste to be hazardous waste. Two exceptions to this are Oregon and Nevada which require wastes that are considered hazardous waste in their state of origin to be managed as hazardous waste.[10]

3.1.2.1 Management in Utah

Utah has received the most manifested hazardous waste from California since 2010. Utah has received 3,158,000 tons (15.2%), ranging from 160,300 tons to 478,100 tons per year (Figure 3.1-10).

[9] There are some non-RCRA wastes, like some treated wood, which are allowed to be disposed in a non-hazardous waste landfill in (HSC § 25230.3).

[10] Oregon Department of Environmental Quality 340-093-0040(2)(a) (Weblink) and Nevada Administrative Code 444.843 (Weblink)

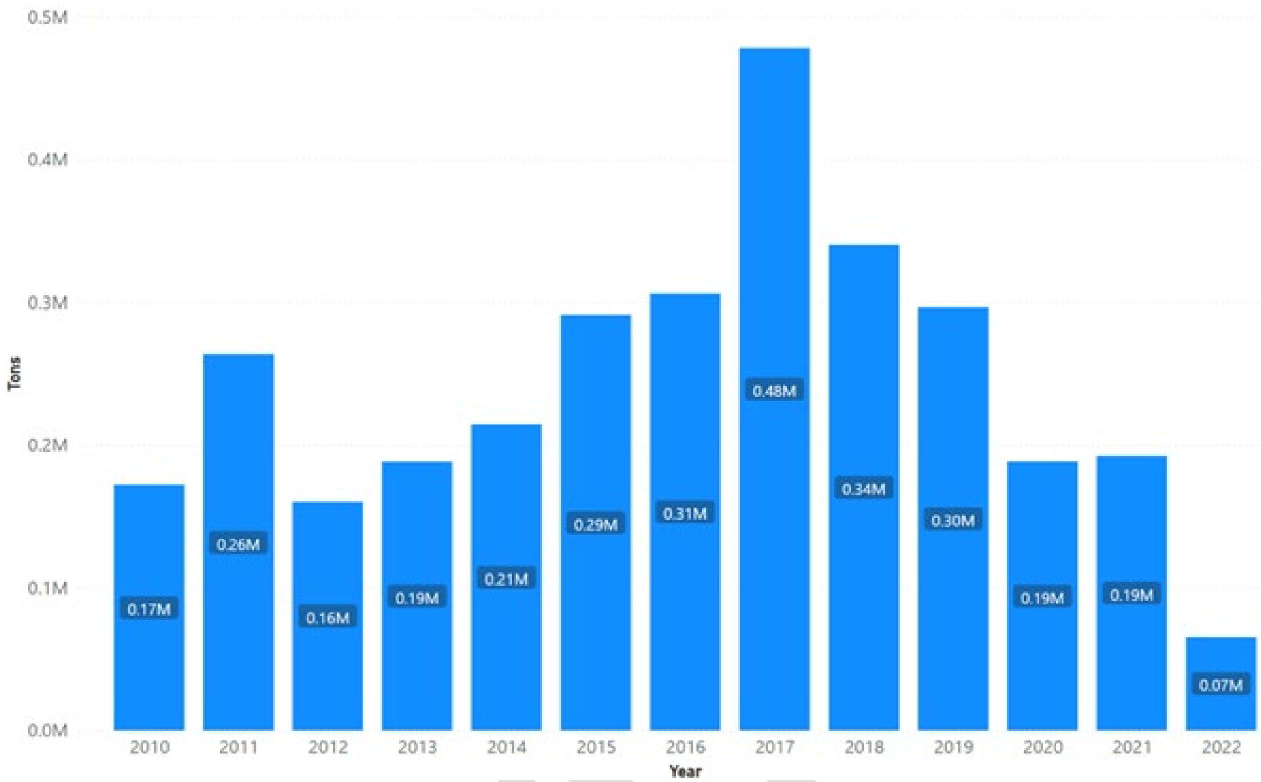

Figure 3.1-10: Quantity of Manifested Hazardous Waste Managed within Utah (January 2010 to May 2022)

About 88.8 percent of all manifested hazardous waste shipped to Utah was non-RCRA hazardous waste, while 10.8 percent was RCRA hazardous waste (Figure 3.1-11).

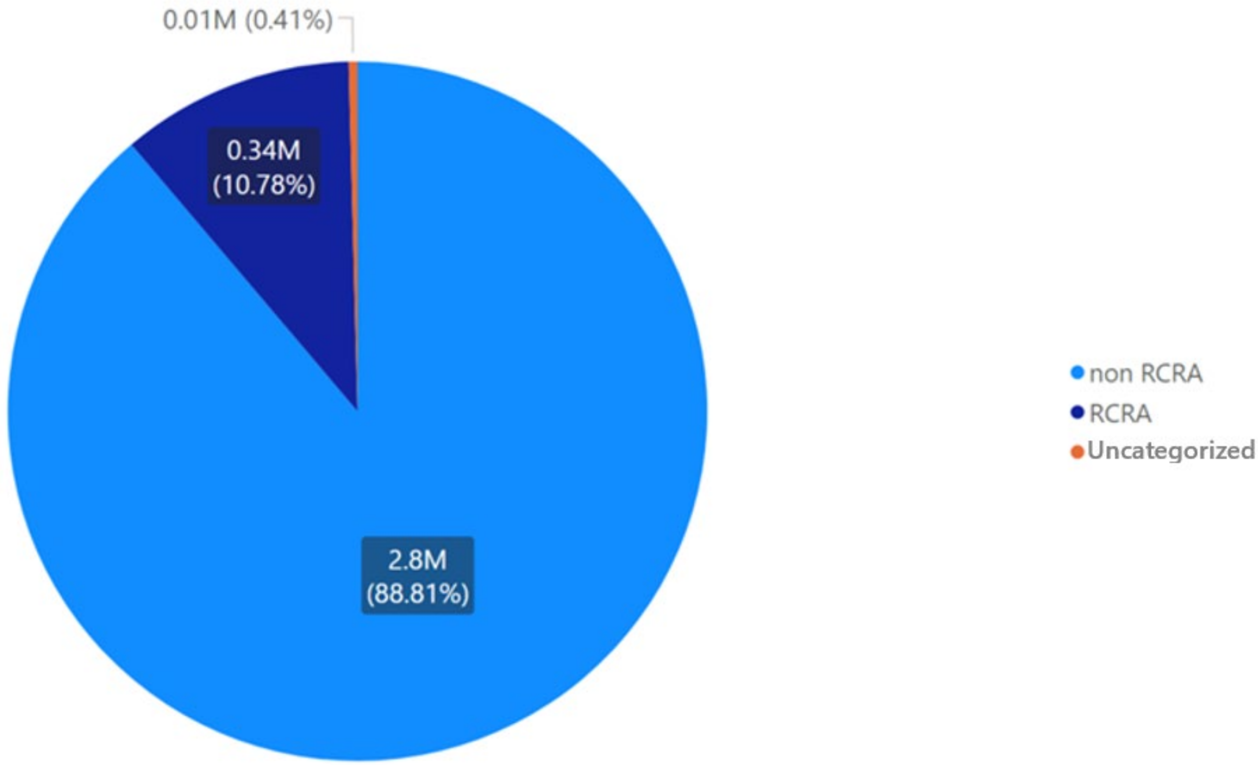

Figure 3.1-11: Amount of RCRA vs Non RCRA Waste Shipped to Utah, tons (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

The primary management method for California's manifested hazardous waste in Utah was landfilling, at 2,762,100 tons (87.5%). The next largest management method, incineration (Management Code H040), accounted for 10.2 percent of the manifested hazardous waste shipped to Utah from California (322,700 tons).

Since 2010, a total of 13 Utah facilities have managed California's hazardous waste. The top two facilities have managed 93.5 percent of the manifested hazardous waste shipped to Utah from California (2,620,900 tons).

One waste stream dominated the manifested hazardous waste shipped to Utah – contaminated soil. Since 2010, about 2,360,000 tons of contaminated soil has been shipped to Utah. This equates to 74.7 percent of all hazardous waste shipped to Utah from California. The primary method of managing California's contaminated soil within Utah is landfilling at 2,344,000 tons (99.3%).

Of the 2,360,000 tons of contaminated soil sent to Utah, 98.9 percent was managed at one facility: ECDC Environmental, a non-hazardous Subtitle D landfill. The company is identified by two EPA ID Numbers within HWTS: UTC093012201 and UTR000000687.

Clean Harbors Aragonite LLC, a commercial hazardous waste incinerator, received 321,900 tons (99.8%) of waste sent to Utah from California for incineration. The company is identified by EPA ID Number UTD981552177 in HWTS.

3.1.2.2 Management in Arizona

Arizona has received the second most manifested hazardous waste from California since 2010. Arizona has received 2,839,400 tons (13.6%) of California's manifested hazardous waste, ranging from 153,100 tons to 321,900 tons per year (Figure 3.1-12).

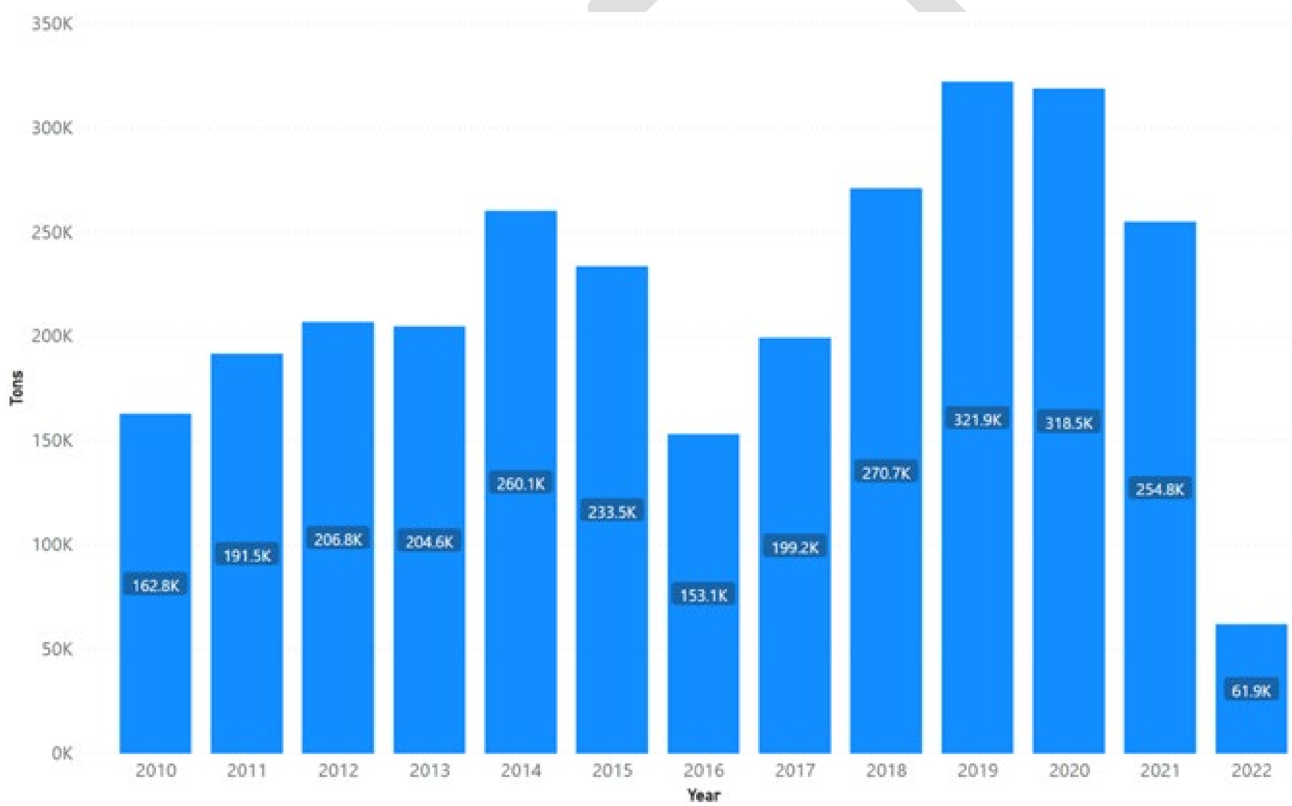

Figure 3.1-12: Amount of Manifested Hazardous Waste Managed within Arizona (January 2010 to May 2022)

About 94.6 percent of all manifested hazardous waste sent to Arizona was non-RCRA hazardous waste, and 3.3 percent was RCRA hazardous waste (Figure 3.1-13).

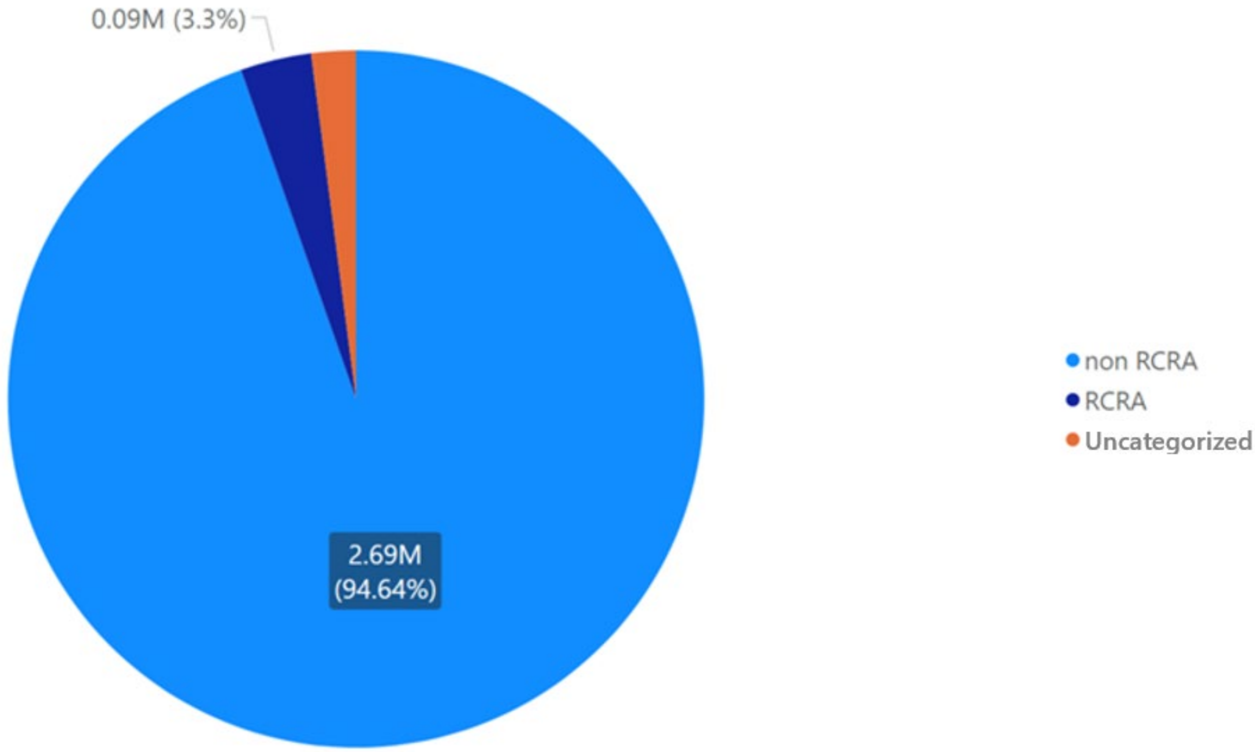

Figure 3.1-13: Amount of RCRA vs Non RCRA Waste Shipped to Arizona, tons (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

The types of manifested hazardous waste shipped to Arizona for management are more varied than those shipped to Utah. Still, the largest waste stream was contaminated soil. Since 2010, about 980,200 tons of contaminated soil has been manifested and shipped to Arizona from California. This equates to 34.5 percent of all manifested hazardous waste sent to Arizona from California. The next largest waste stream was inorganic solid waste, with 619,400 tons shipped since 2010. The third largest waste stream shipped to Arizona was asbestos-containing waste, with 298,900 tons shipped since 2010.

The top three waste streams shipped to Arizona from California are managed at three facilities:

- Copper Mountain Landfill (EPA ID Number: AZR000002428)
- La Paz County Landfill (EPA ID Number: AZR000520882 and AZC950823111)
- South Yuma County Landfill (EPA ID Number: AZR000506980)

Of the 980,200 tons of manifested contaminated soil shipped to Arizona, 94.0 percent was managed at:

- South Yuma County Landfill – 491,200 tons (50.1%)
- La Paz County Landfill – 266,000 tons (27.1%)
- Copper Mountain Landfill – 164,900 tons (16.8%)

The next largest waste stream shipped to Arizona from California was inorganic solid waste. Of the 619,400 tons sent to Arizona, 87.3 percent was managed at:

- Copper Mountain Landfill – 228,200 tons (36.8%)
- La Paz County Landfill – 219,300 tons (35.4%)
- South Yuma County Landfill – 93,500 tons (15.1%)

The third largest waste stream shipped to Arizona from California was asbestos-containing waste. Of the 298,900 tons sent to Arizona, 99.9 percent was managed at:

- La Paz County Landfill – 249,900 tons (83.6%)
- South Yuma County Landfill – 45,000 tons (15.1%)
- Copper Mountain Landfill – 3,600 tons (1.2%)

3.1.2.3 Management In Nevada

Nevada has received the third most manifested hazardous waste from California generators since 2010. Nevada has received 2,169,400 tons (10.4%) of California's manifested hazardous waste, ranging from 139,300 tons to 234,400 tons per year (Figure 3.1-14).

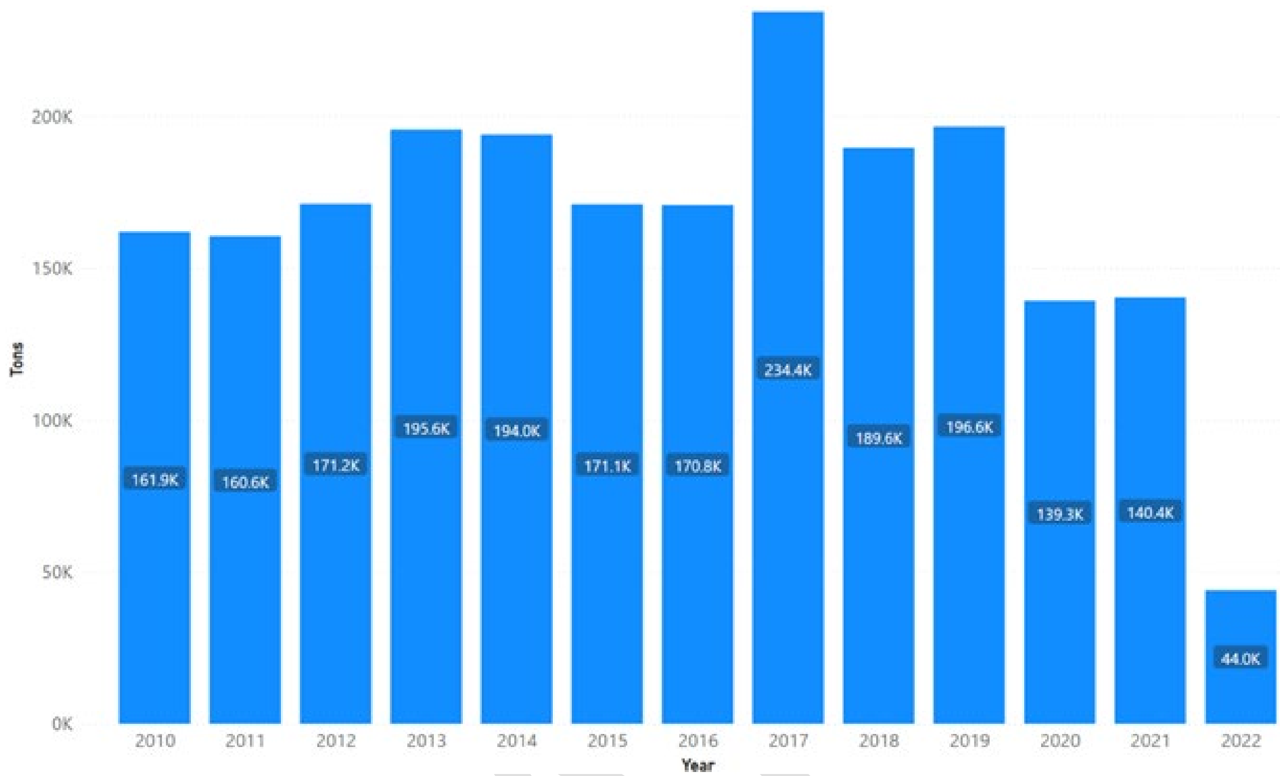

Figure 3.1-14: Quantity of Manifested Hazardous Waste Managed within Nevada (January 2010 to May 2022)

About 1,236,600 tons (57.0%) of all manifested hazardous waste shipped to Nevada from California was non-RCRA hazardous waste, and 910,400 tons (42.0%) was RCRA hazardous waste (Figure 3.1-15).

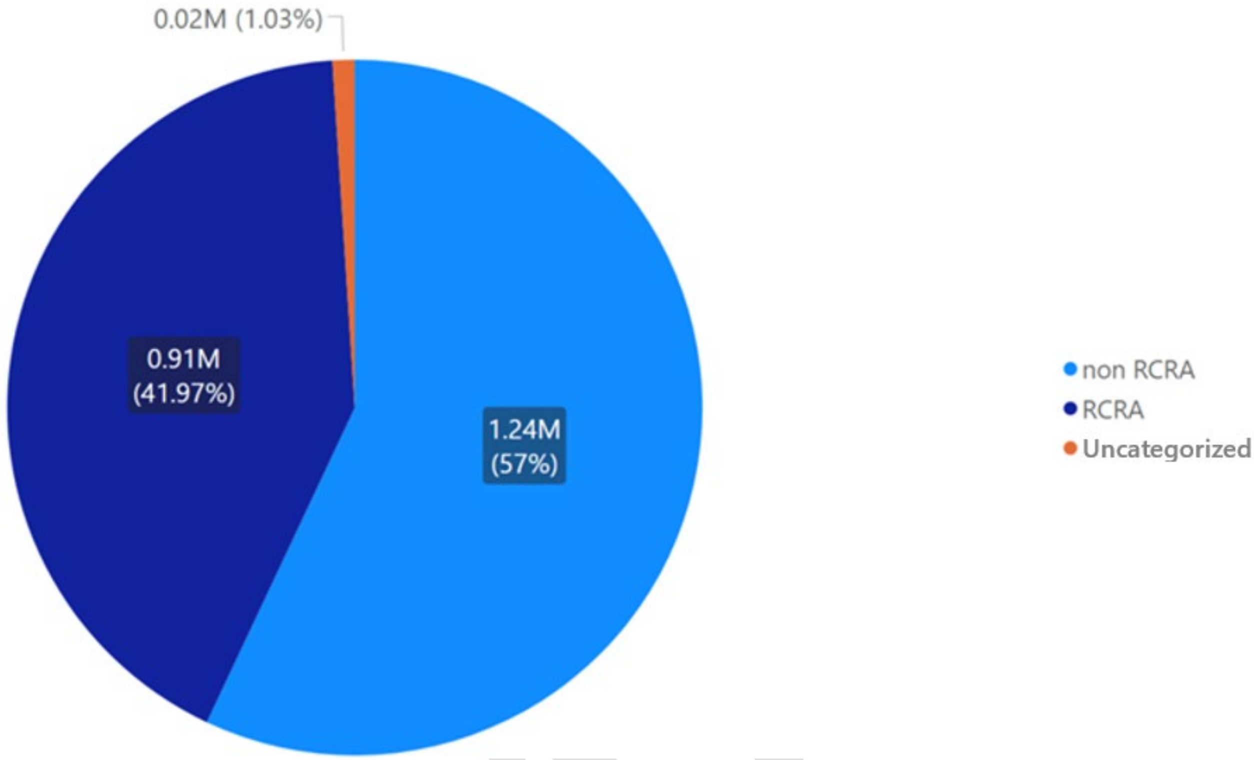

Figure 3.1-15: Quantity of RCRA vs Non RCRA Waste Shipped to Nevada, tons (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

Unlike in Utah or Arizona, the largest waste stream shipped to Nevada since 2010 has been inorganic solid waste. California has shipped about 739,900 tons of inorganic solid waste, which equates to 34.1 percent of all manifested hazardous waste shipped to Nevada.

Of the 739,900 tons of manifested inorganic solid waste shipped to Nevada from California, 730,600 (98.8%) was managed at US Ecology Nevada, a hazardous waste landfill. This facility is identified in HWTS as EPA ID number NVT330010000.

The next largest waste stream shipped to Nevada was lead waste (RCRA Waste Code D008). Of the 594,000 tons sent to Nevada, 95.1 percent was managed at US Ecology Nevada.

The third largest waste stream shipped to Nevada was contaminated soil. Of the 375,700 tons sent to Nevada, 98.5 percent was also managed at US Ecology Nevada.

3.1.3 Amount of Manifested Hazardous Waste Disposed to Land

In accordance with HSC § 25135(b)(1)(C), the following information quantifies the amount of manifested hazardous waste disposed to land, both within California and in other states.

To track how manifested hazardous waste is being managed, hazardous waste manifests use Management Method Codes to describe the type of management system used to treat, recover, or dispose of the waste.

To complete this analysis, two management codes were analyzed:

- H131 Land treatment or application (to include on-site treatment and/or stabilization)
- H132 Landfill or surface impoundment that will be closed as landfill (to include prior treatment and/or stabilization)

Since 2010, 59.2 percent of California's manifested hazardous waste (12,465,300 tons) has been disposed to land. This includes both RCRA and non-RCRA waste. Annual quantities of hazardous waste disposed to land averaged 1,016,000 tons and ranged from 773,700 tons to 1,283,600 tons. Figure 3.1-16 shows the annual quantity of hazardous waste disposed to land since the start of 2010.

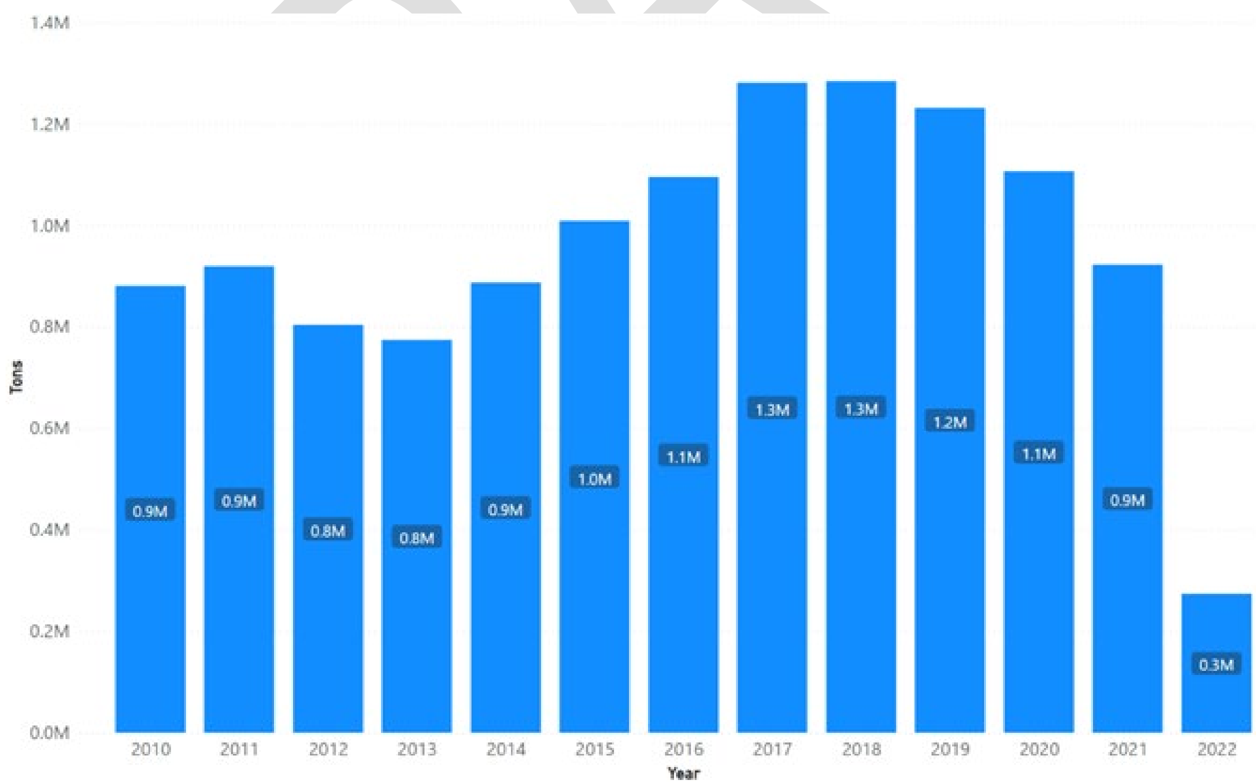

Figure 3.1-16: Annual Quantity of Hazardous Waste Disposed to Land

About 88 percent of all land-disposed manifested hazardous waste was non-RCRA hazardous waste (10,966,200 tons). Just under 11 percent was RCRA hazardous waste (Figure 3.1-17).

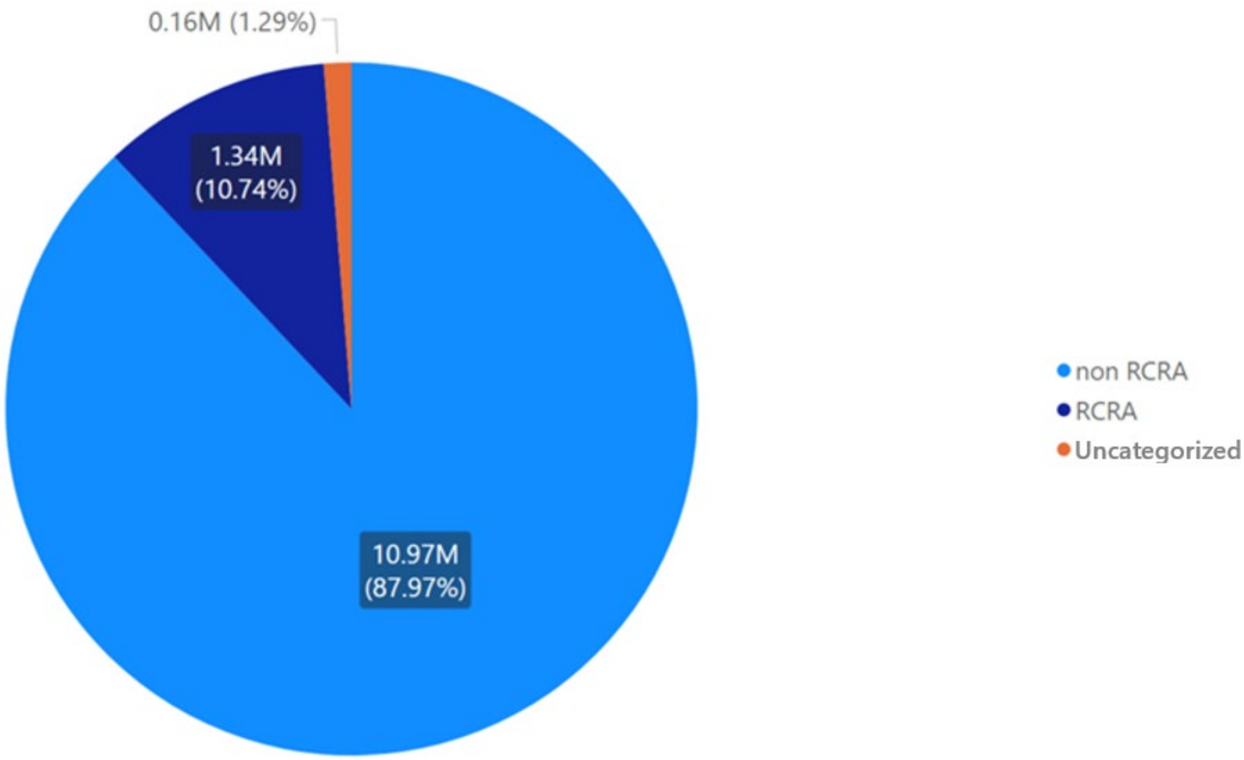

Figure 3.1-17: Breakdown of RCRA vs non-RCRA Waste being Land Disposed, tons (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

Just over half of California's land-disposed hazardous waste has been disposed of outside of California. Since 2010, approximately 6,509,300 tons (52.2%) was disposed of outside California, with the remaining 5,956,000 tons (47.8%) disposed of within California (Figure 3.1-18).

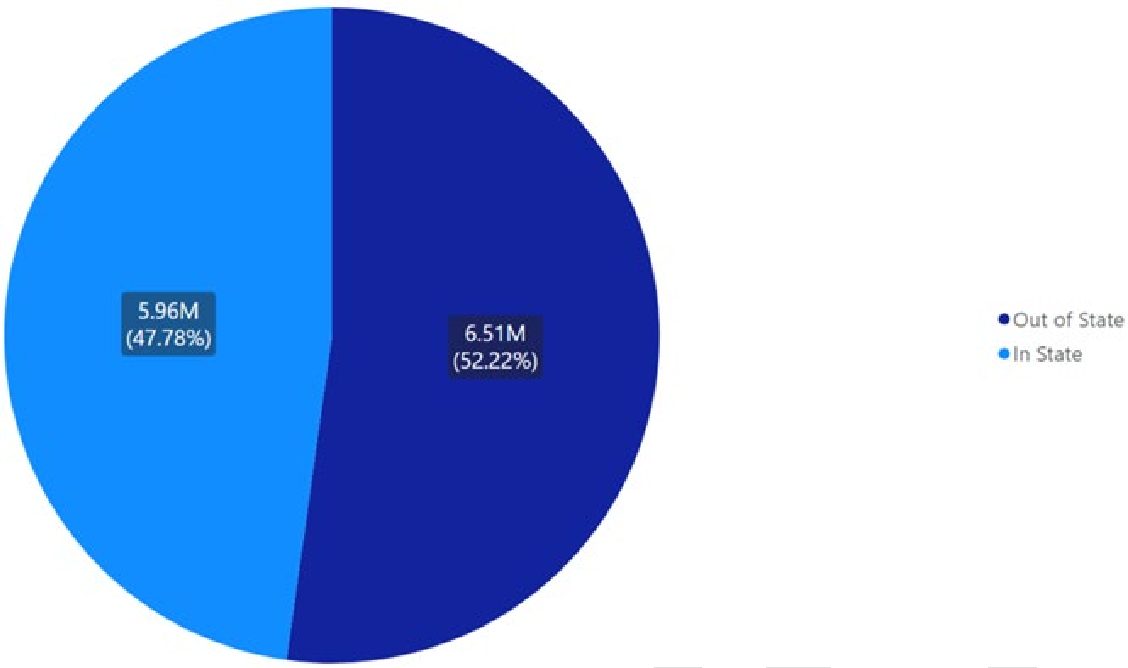

Figure 3.1-18: Management Location of California's Manifested RCRA Hazardous Waste, tons (January 2010 to May 2022)

California's land-disposed manifested hazardous waste has been disposed of in 26 other states since 2010 (Figure 3.1-19). Nearly half has gone to three states:

- Utah – 2,762,300 tons (22.3%)
- Arizona – 1,970,600 tons (15.9%)
- Nevada – 1,433,400 tons (11.6%)

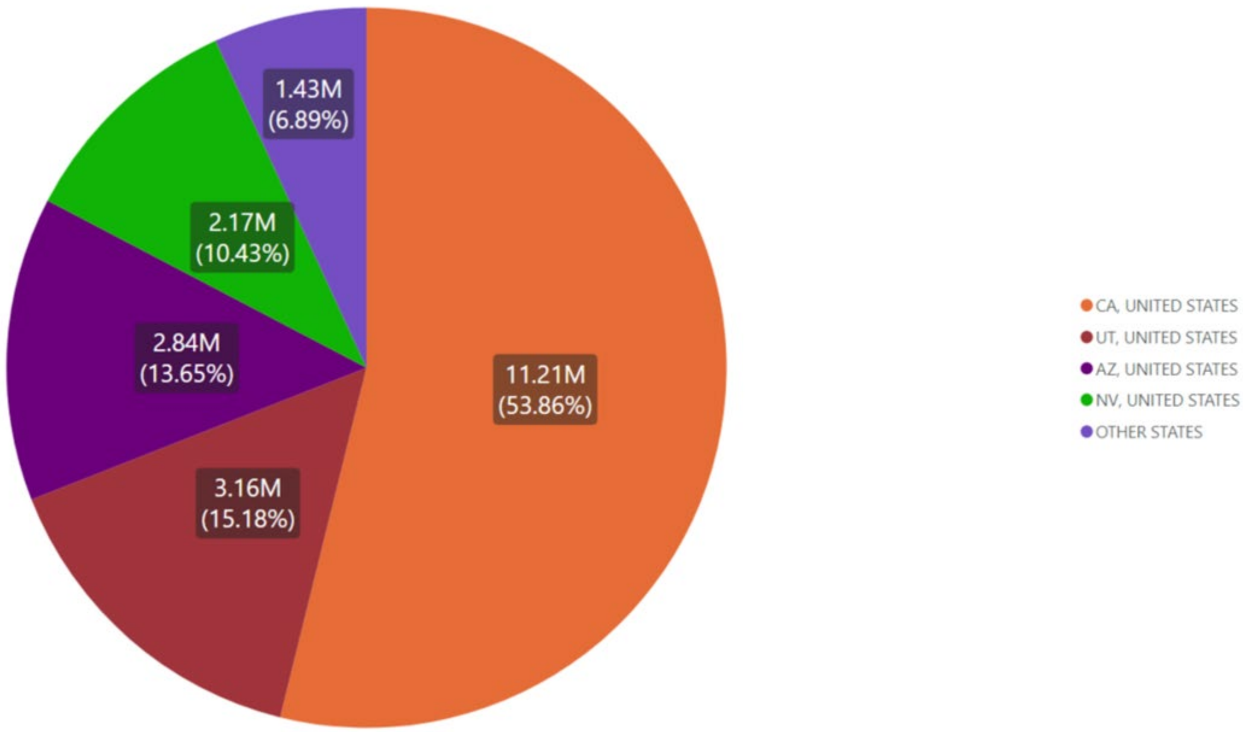

Figure 3.1-19: States that Accept California's Hazardous Waste for Land Disposal, tons (January 2010 to May 2022)

As shown in Section 2, 81 percent of the manifested hazardous waste generated in California since 2010 is non-RCRA. In most cases, this waste is not required to be managed as hazardous waste in other states, meaning they are not required to dispose of California's non-RCRA waste in permitted hazardous waste land disposal facilities. Figure 3.1-20 compares the amount of manifested hazardous waste disposed of at hazardous waste landfills (Class 1 Landfill) with the amount disposed of in other landfills (Class 2 and Class 3).[11] Since 2010, approximately 7,091,800 tons (56.9%) of California's manifested land-disposed hazardous waste was managed at permitted Class 1 landfills, and the remaining 5,373,400 tons (43.1%) was disposed of at other Class 2 or Class 3 landfills.

[11] Hazardous waste landfills (Class 1) are regulated under RCRA Subtitle C and non-hazardous Subtitle D landfills (Class 2 and Class 3) are regulated under RCRA Subtitle D

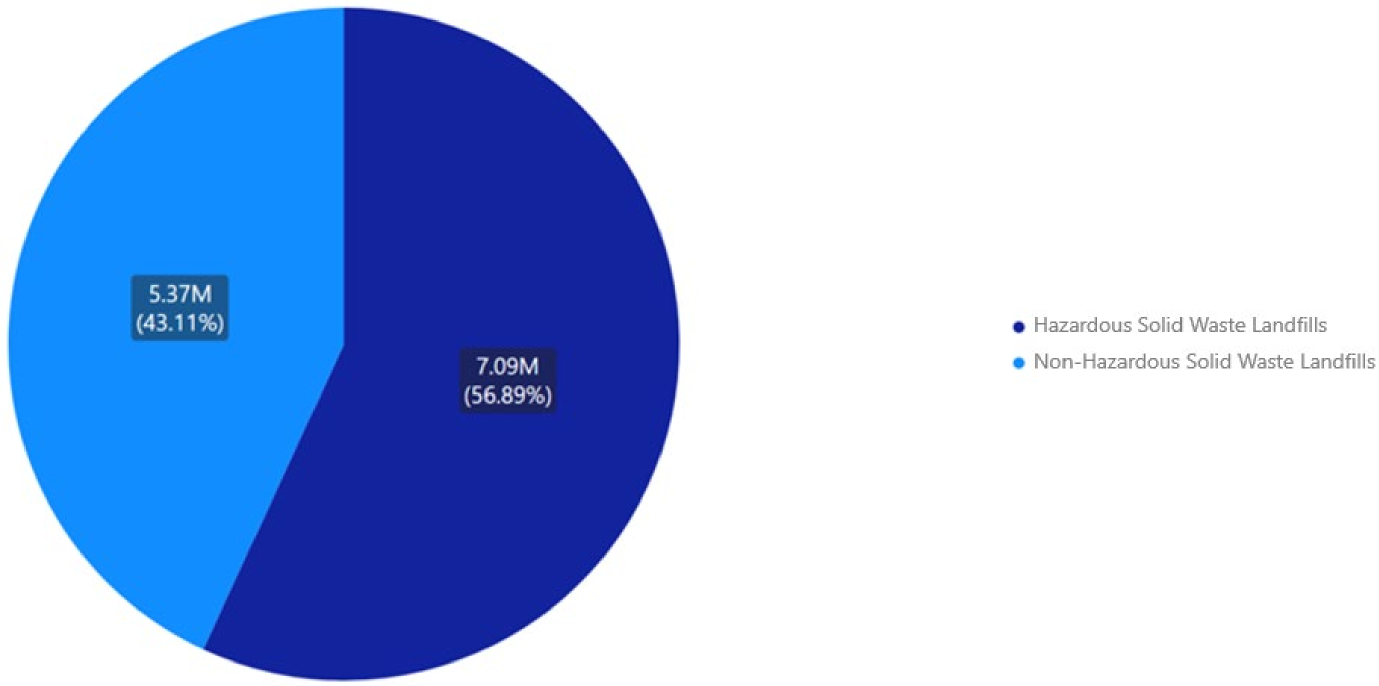

Figure 3.1-20: Land Disposal of California's Hazardous Waste, tons (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

3.1.3.1 Hazardous Waste Landfill Disposal

Permitted hazardous waste landfills are engineered sites where non-liquid hazardous waste is disposed of and which must be properly closed and covered once they are at capacity. These locations are designed and operated to minimize any release of hazardous waste into the environment.

Disposal of hazardous waste by means other than a permitted facility constitutes illegal disposal. Illegal disposal occurs either intentionally or out of ignorance. Examples of intentional illegal disposal include wastes that are abandoned along roadways, released into ditches or waterways, or released onto soils. These activities are often done to avoid the expense of proper waste management activities or to evade documentation as part of other illegal activities. Accidental illegal disposal usually occurs because an individual or facility operator does not realize the waste is considered hazardous under federal or state regulations and disposes of the waste, for instance, in a municipal landfill. It is very difficult, if not impossible, to obtain quantitative data on wastes that are disposed of illegally. However, if waste is found to be illegally disposed of is then managed appropriately, the quantity would be included in HWTS because it would be manifested when removed.

Due to the complexity and stringent oversight of these facilities, not all states have permitted hazardous waste landfills. There are 24 permitted hazardous waste landfills in the United States. Figure 3.1-21 shows a map of all permitted hazardous waste landfills still in operation.

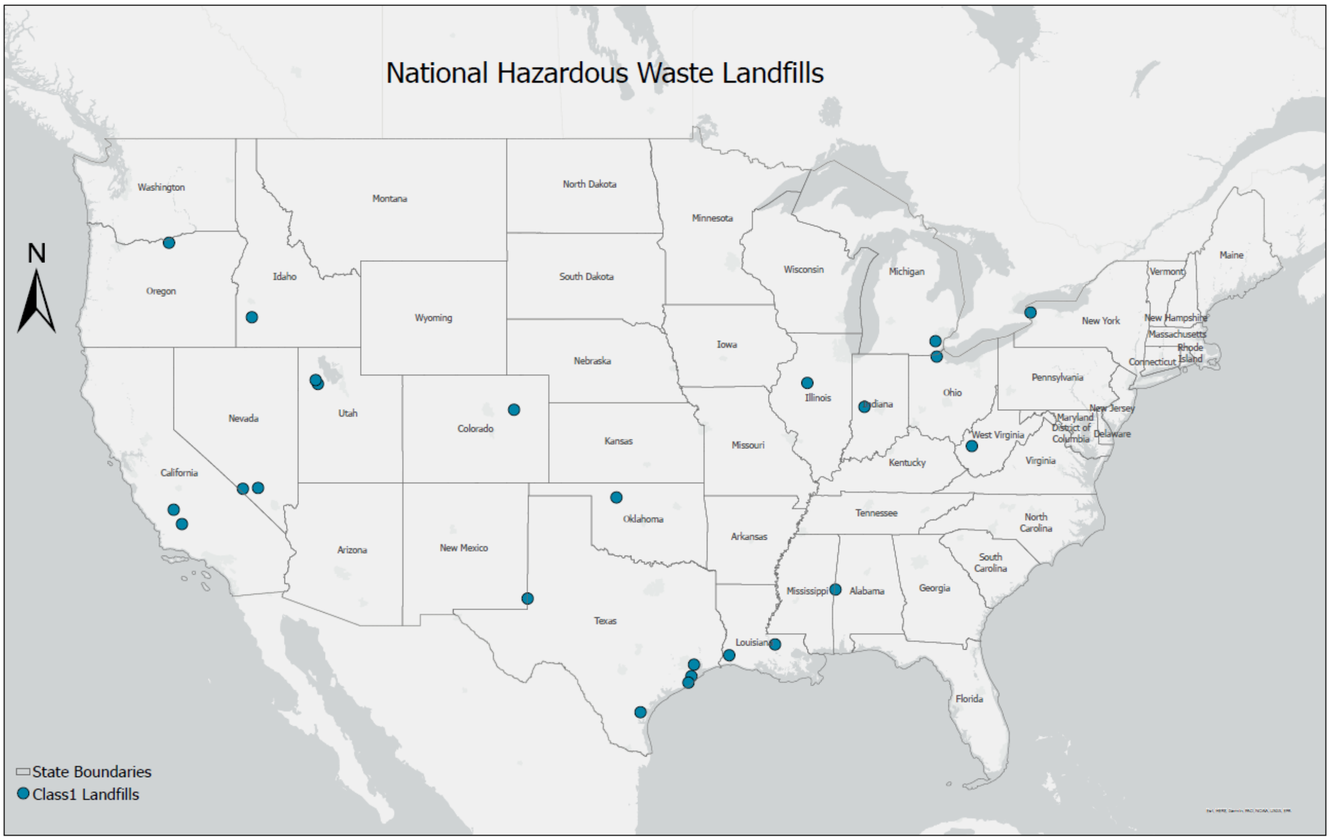

Figure 3.1-21: Map of Permitted Hazardous Waste Landfills in operation (as of 2022)

Since 2010, about 7,091,800 tons of California's manifested hazardous waste has been land disposed at permitted hazardous waste landfills. Annual quantities have ranged from 431,600 tons to 734,200 tons. Figure 3.1-22 shows California's manifested hazardous waste land disposed at permitted hazardous waste landfills annually since the start of 2010.

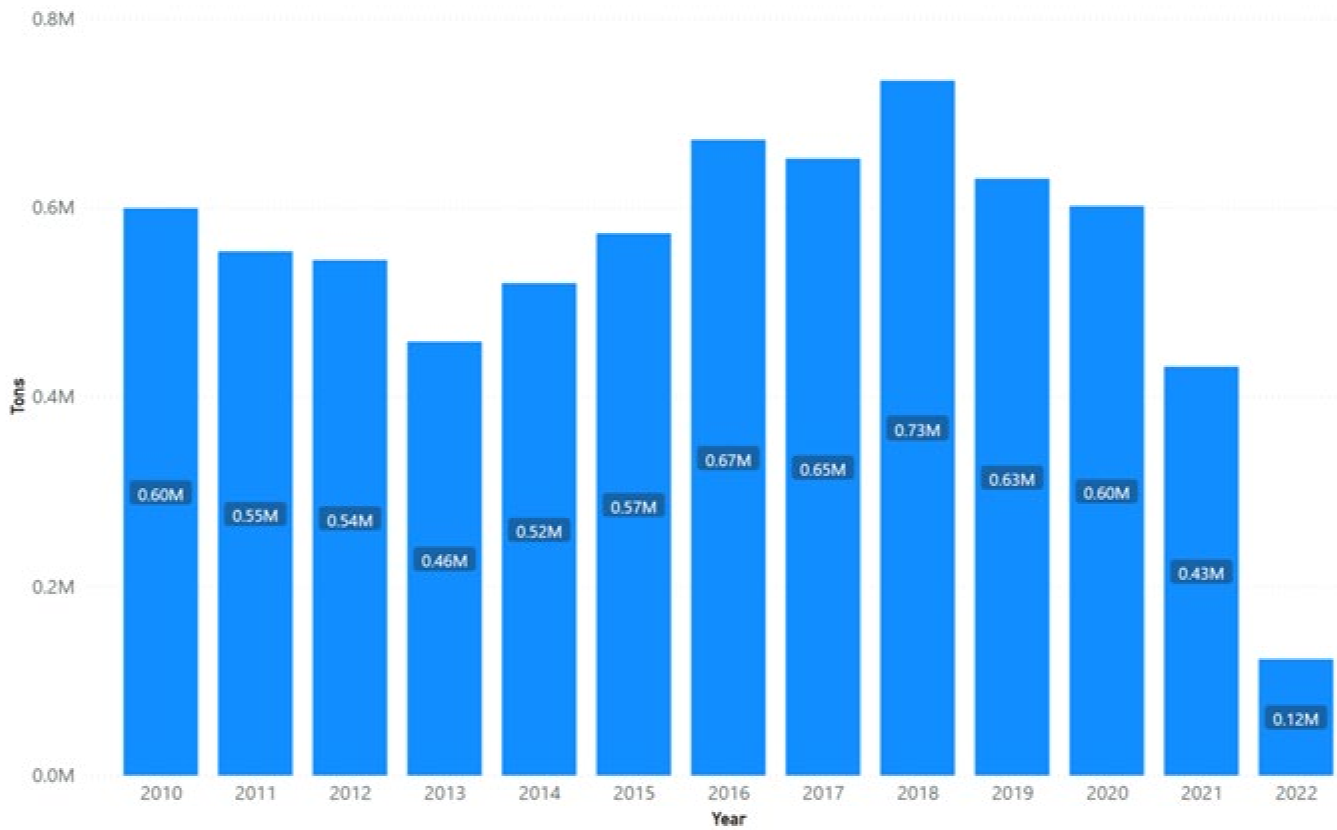

Figure 3.1--22: Annual Quantity of Hazardous Waste for Land Disposal at Permitted Hazardous Waste Landfills

About 81 percent of manifested hazardous waste land disposed at permitted hazardous waste landfills since 2010 was non-RCRA hazardous waste, and about 18 percent was RCRA hazardous waste (Figure 3.1-23).

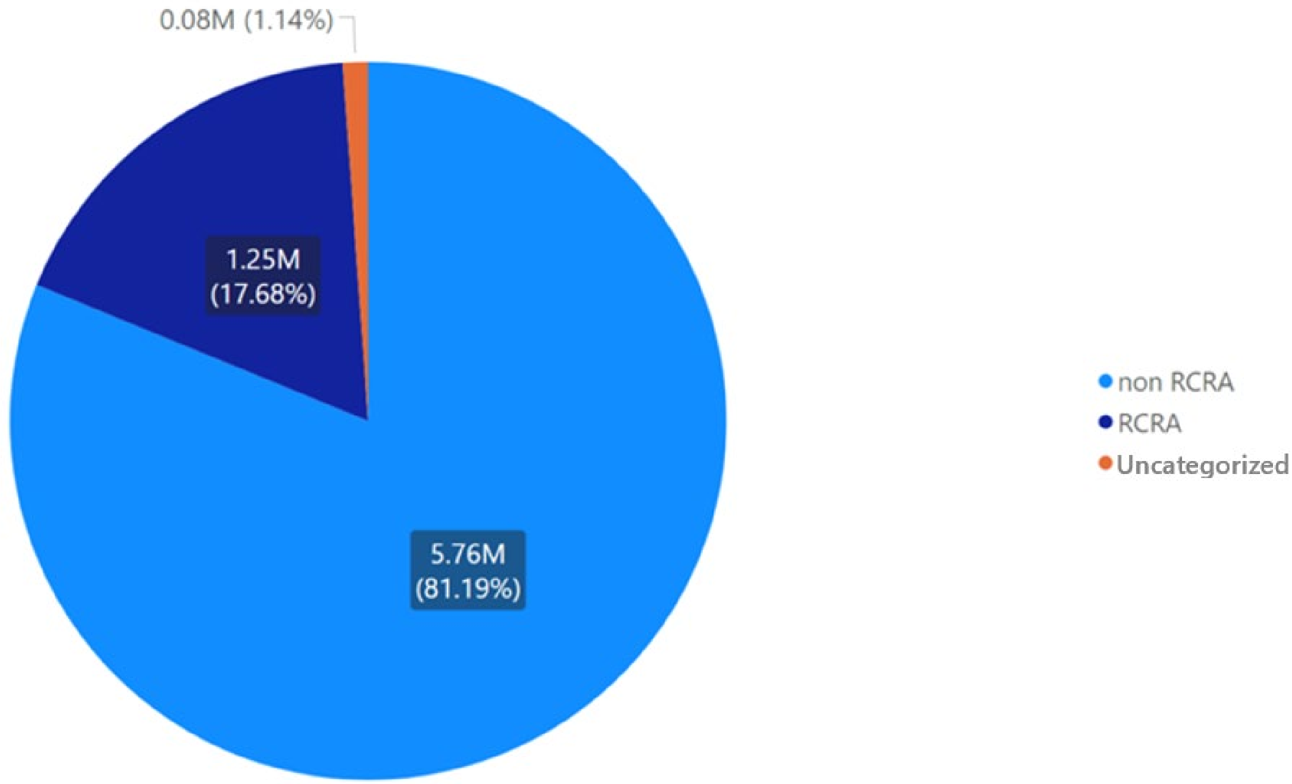

Figure 3.1-23: RCRA vs Non RCRA Waste being Land Disposed at Permitted Hazardous Waste Landfills, tons (January 2010 to May 2022)

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

3.1.3.1.1 Hazardous Waste Landfill Capacity

Hazardous waste landfill capacity is an important consideration for the proper management of California's hazardous waste. U.S. EPA's 2019 National Capacity Assessment Report reiterates important details about the complexities of regulating hazardous waste landfills.[13] First, hazardous waste landfill capacity is finite and landfills are essential to managing the nation's hazardous waste. Second, hazardous waste landfills can be costly to operate and difficult to permit.

California has two hazardous waste landfills currently in operation – Clean Harbors Buttonwillow and Chemical Waste Management Inc. Kettleman. According to the 2019 Capacity Report, the combined remaining capacity at Clean Harbors Buttonwillow (5,943,100 tons) and Chemical Waste Management (3,798,000 tons) is 9,741,100 tons.

[13] U.S. EPA. National Capacity Assessment Report. December 2019.

At the current rate of disposal, with about 47.8 percent of California's land-disposed hazardous waste being disposed of in the state each year, these two landfills have a combined 20.1 years of permitted capacity remaining. If 100 percent of the state's 1,016,000 tons per year were disposed of in California, these two landfills would have a combined 9.6 years of permitted capacity remaining.

Any change to the available hazardous waste landfill capacity can alter where California's waste is managed. This was seen in the 2000's when the Chemical Waste Management Kettleman Hills Facility (KHF) began winding down operations and accepting less waste as it awaited approval of its landfill expansion. During that time period, the proportion of hazardous waste shipped out of state increased from about 25 percent of all hazardous waste generated to nearly 50 percent.

3.1.3.2 Non-Hazardous Waste Landfill Disposal

Manifested hazardous waste disposed of in California must be disposed of in a permitted Class 1 hazardous waste landfill. This includes RCRA and non-RCRA hazardous wastes. Some exceptions include non-RCRA Asbestos-containing Waste (State Waste Code 151) and Treated Wood Waste (State Waste Code 614). Within California, these wastes can be managed at authorized Class 2 or Class 3 solid waste landfills.[14] However, in almost all other states, non-RCRA hazardous waste can be managed at non-hazardous Class 2 or Class 3 solid waste landfills.

Since 2010, about 5,373,400 tons of manifested hazardous waste has been land disposed at non-hazardous solid waste landfills. Annual quantities have ranged from 259,200 tons to 1,280,900 tons. Figure 3.1-24 shows the annual quantity of California's hazardous waste that has been land disposed at non-hazardous Subtitle D landfills since 2010.

[14] Disposal Facilities Authorized to Accept Treated Wood Waste (Weblink)

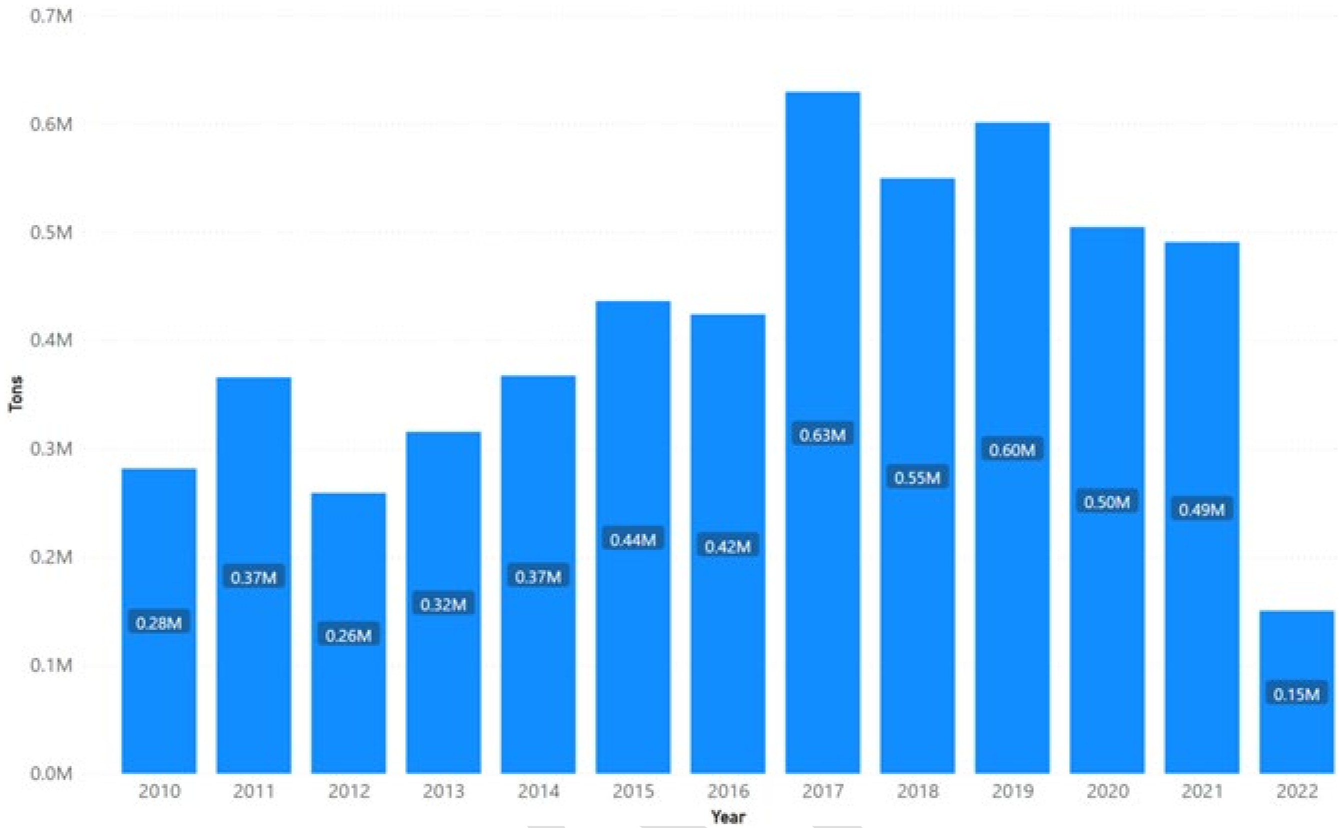

Figure 3.1-24: Annual Quantity of Hazardous Waste Land Disposed at Non-Hazardous Subtitle D Landfills

About 97 percent of manifested hazardous waste land disposed at non-hazardous Subtitle D landfills was non-RCRA hazardous waste, and about 2 percent was RCRA hazardous waste (Figure 3.1-25).

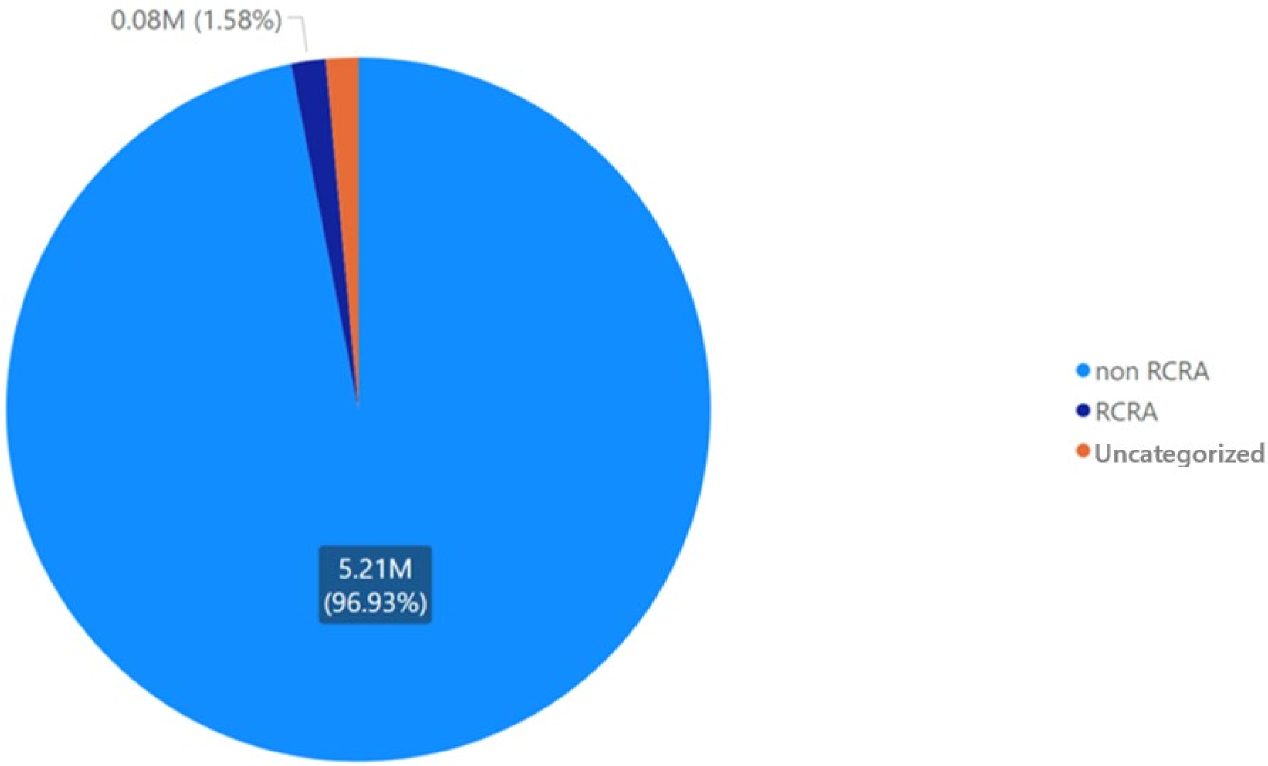

Figure 3.1-25: Breakdown of RCRA vs Non RCRA Hazardous Waste Land Disposed at non-Hazardous Landfills since 2010, tons

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

3.1.4 Amount of Manifested Hazardous Waste Treated

In accordance with Health and Safety Code § 25135(b)(1)(D), this Report has quantified the amount of manifested hazardous waste that has been treated, both within California and in other states.

Not all hazardous waste presents equivalent risks to human health and the environment. Some manifested hazardous waste is prohibited from land disposal if it has not been adequately treated. The criteria hazardous waste must meet before being disposed of are called treatment standards. These are either based on specific concentrations of hazardous constituents or specific treatment technologies that are required. Approved technologies have been identified that best minimize the mobility and/or toxicity of hazardous constituents. These are known as Best Demonstrated Available Technologies (BDAT) and may vary depending on the waste stream. Treatment standards are found in Cal. Code Regs., tit. 22, article 4.

To determine the quantity of manifested waste that has been treated, this Report utilized the waste management codes found on a manifest. The associated waste management codes are:

- H040 Incineration
- H071 Chemical reduction with or without precipitation
- H073 Cyanide destruction with or without precipitation
- H075 Chemical oxidation
- H076 Wet air oxidation
- H077 Chemical precipitation with or without pre-treatment
- H084 Biological treatment
- H082 Adsorption
- H083 Air or steam stripping
- H101 Sludge treatment and/or dewatering
- H103 Absorption
- H111 Stabilization and/or chemical fixation prior to disposal
- H112 Macro-encapsulation prior to disposal at another site
- H121 Neutralization
- H122 Evaporation
- H123 Settling or clarification
- H124 Phase separation
- H129 Other treatment methods

A review of this information within HWTS reveals that, since 2010, about 778,600 tons (3.7%) of California's manifested hazardous waste has been treated – between 46,000 tons and 126,000 tons annually. Figure 3.1-26 shows the quantity of California's manifested hazardous waste treated annually since the start of 2010.

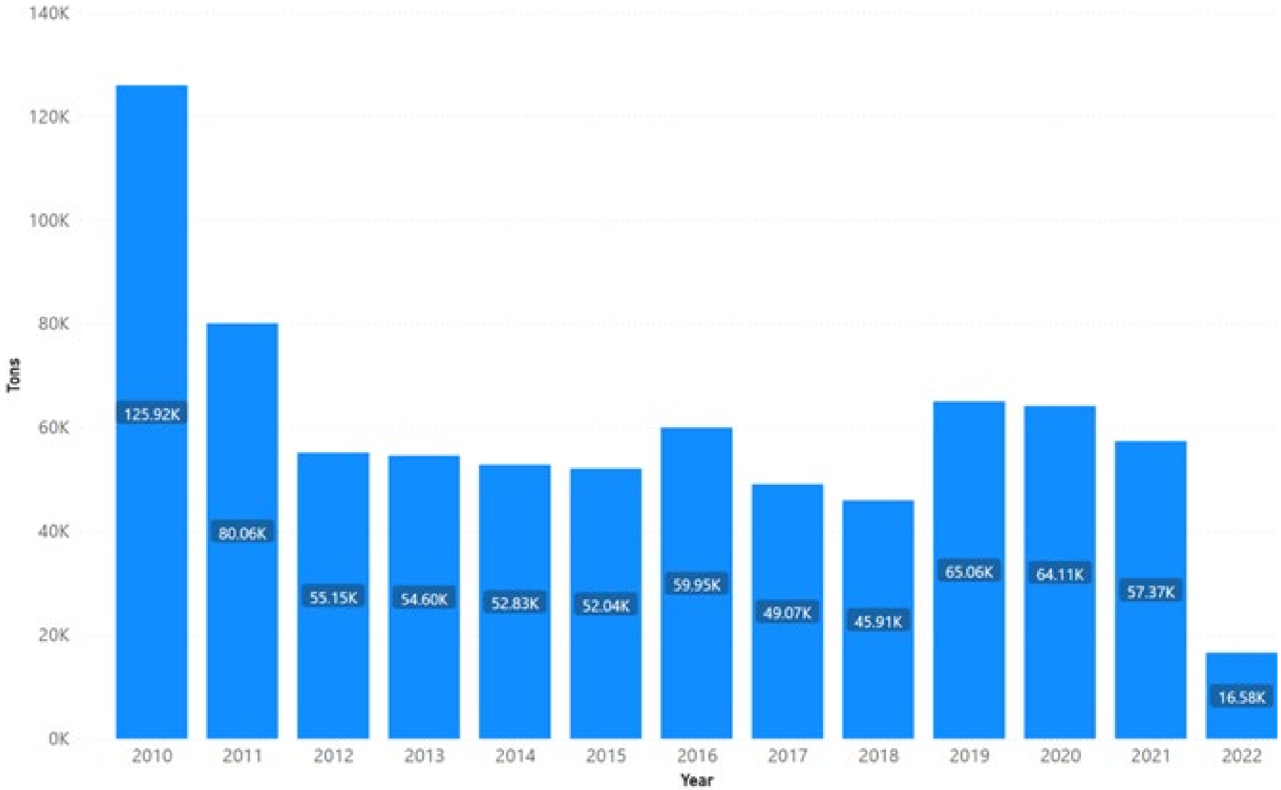

Figure 3.1-26: Annual Quantity of Hazardous Waste Treated

About 66.9 percent of all treated manifested hazardous waste was RCRA hazardous waste, and 32.0 percent was non-RCRA hazardous waste (Figure 3.1-27).

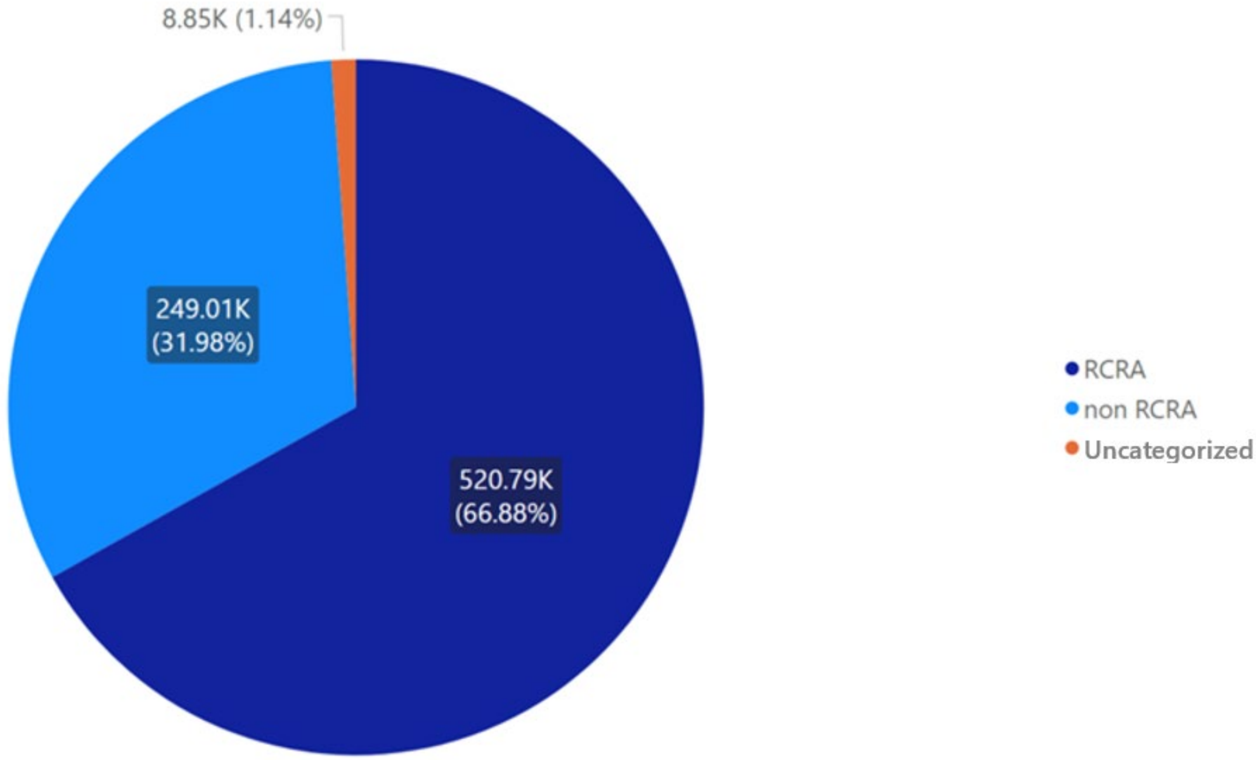

Figure 3.1-27: RCRA vs Non RCRA Hazardous Waste Treated since 2010, tons

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

As discussed earlier in this section, there are many methods of treating hazardous waste. Incineration is the most common method. Since 2010, about 80 percent of the manifested hazardous waste generated in California (623,800 tons) has been treated through incineration out of state (Figure 3.1-28).

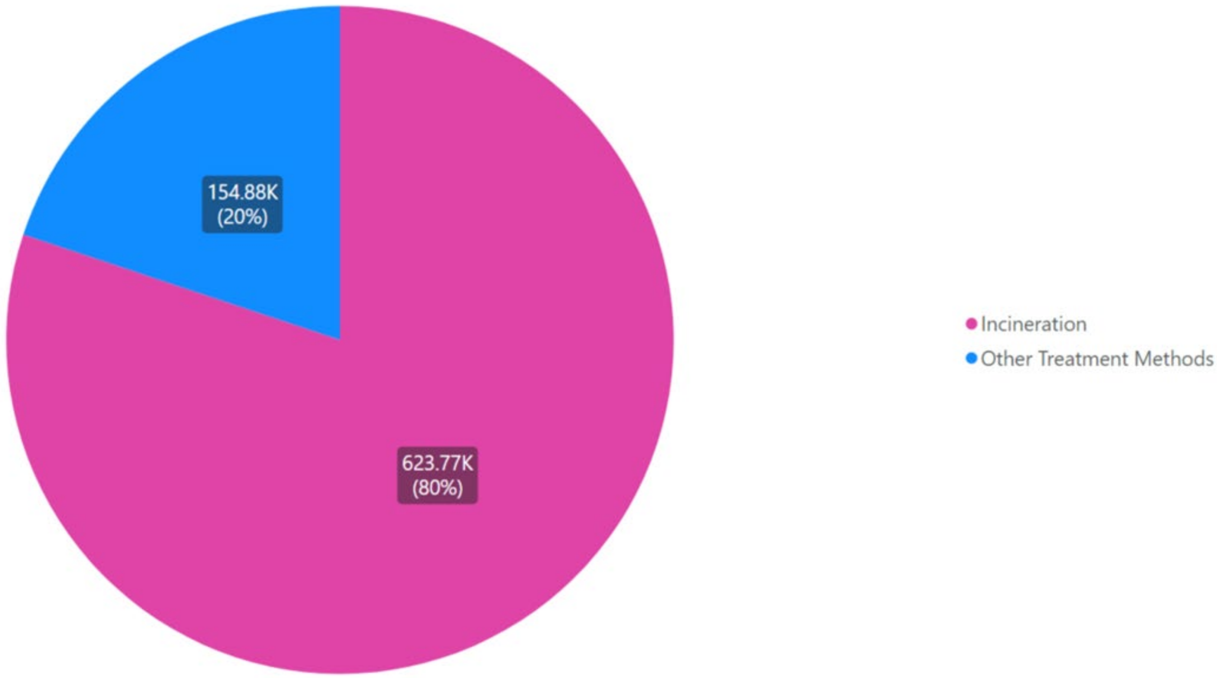

Figure 3.1-28: Quantity of Hazardous Waste Treatment per Management Method, tons

The remaining 154.900 tons (20%) of California's manifested hazardous waste has been treated through stabilization, chemical precipitation, neutralization, or other treatment methods. (Figure 3.1-XXX).

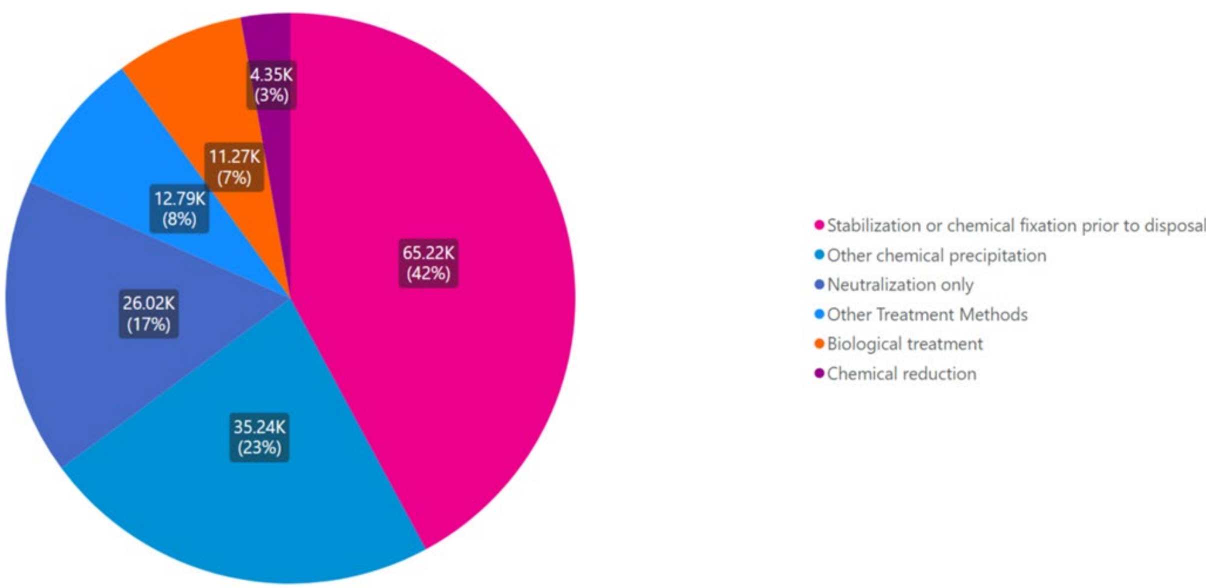

Figure 3.129: Quantity of Hazardous Waste Treatment per Management Method excluding Incineration, tons

Since 2010, 16.5 percent of California's hazardous waste has been treated within the state's borders (128,700 tons), while 83.5 percent (650,000 tons) has been treated out of state (Figure 3.1-29).

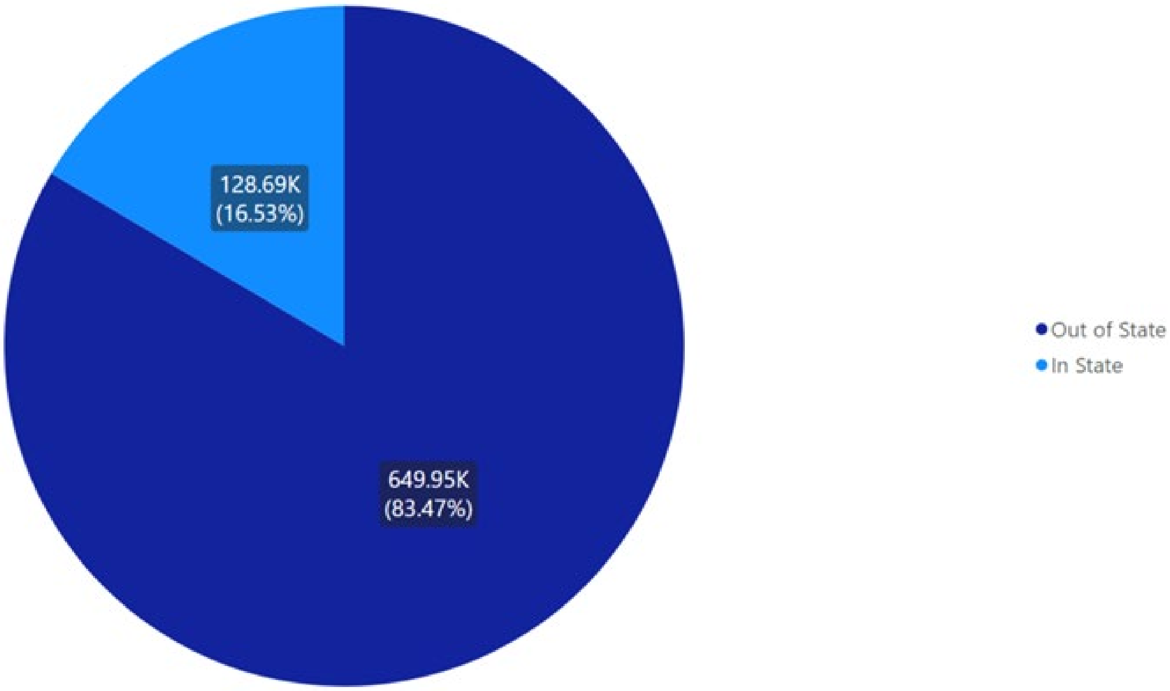

Figure 3.1-30: Breakdown of Hazardous Waste Treatment in California vs Out of State, tons

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

One of the largest factors contributing to this disparity is the fact that 80 percent of all treated waste is shipped to be incinerated as required by RCRA, and there are no commercial incinerators in California. The closest commercial incinerator is in Utah. Figure 3.1-30 provides a map of all the nation's commercial incinerators.

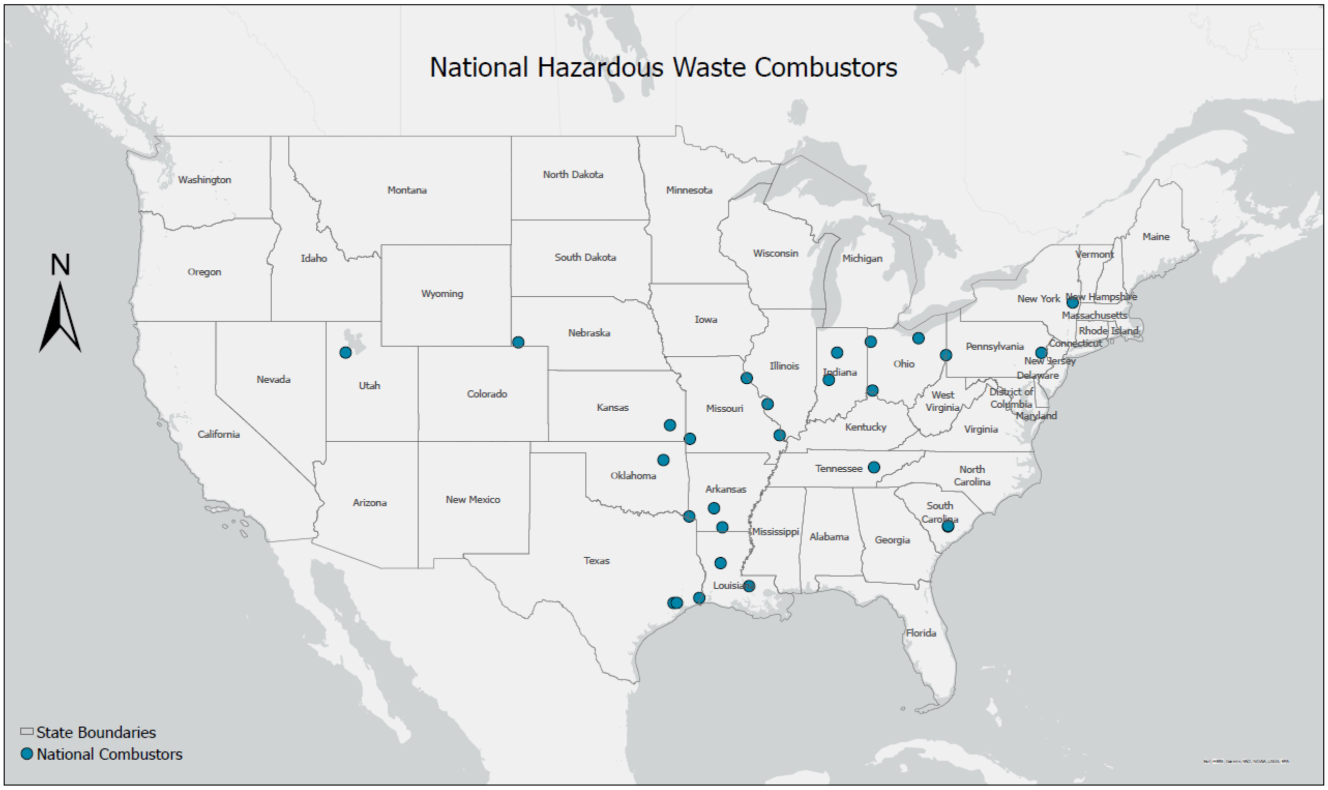

Figure 3.1-31: Map of National Commercial Incinerators

In June 2021, U.S. EPA became aware that some commercial hazardous waste incinerators would no longer accept containerized hazardous waste due to backlogs at their facilities. This limitation presented significant issues for hazardous waste generators because of regulatory limitations on storage times. Because many commercial incinerators stopped accepting hazardous waste that is required to be incinerated to meet land disposal restriction treatment standards, some generators could not locate any permitted TSDF to send their waste within the regulatory timeframes.

In August 2021, U.S. EPA issued a memorandum that provided regulatory options for containerized waste needing incineration. The August 2021 memorandum indicated that the backlog may not be fully resolved until the first quarter of 2022.

3.1.5 Amount of Hazardous Waste Regulated under RCRA

In accordance with Health and Safety Code 25135(b)(1)(E), this Report has quantified the amount of manifested hazardous waste that is regulated under RCRA.

Since 2010, California has generated 21.05 million tons of manifested hazardous waste, with approximately 18 percent of that being RCRA hazardous waste (3.79 million tons). Generation of manifested RCRA hazardous waste has averaged 310,000 tons per year, ranging from 224,700 tons to 398,700 tons per year (Figure 3.1-31).

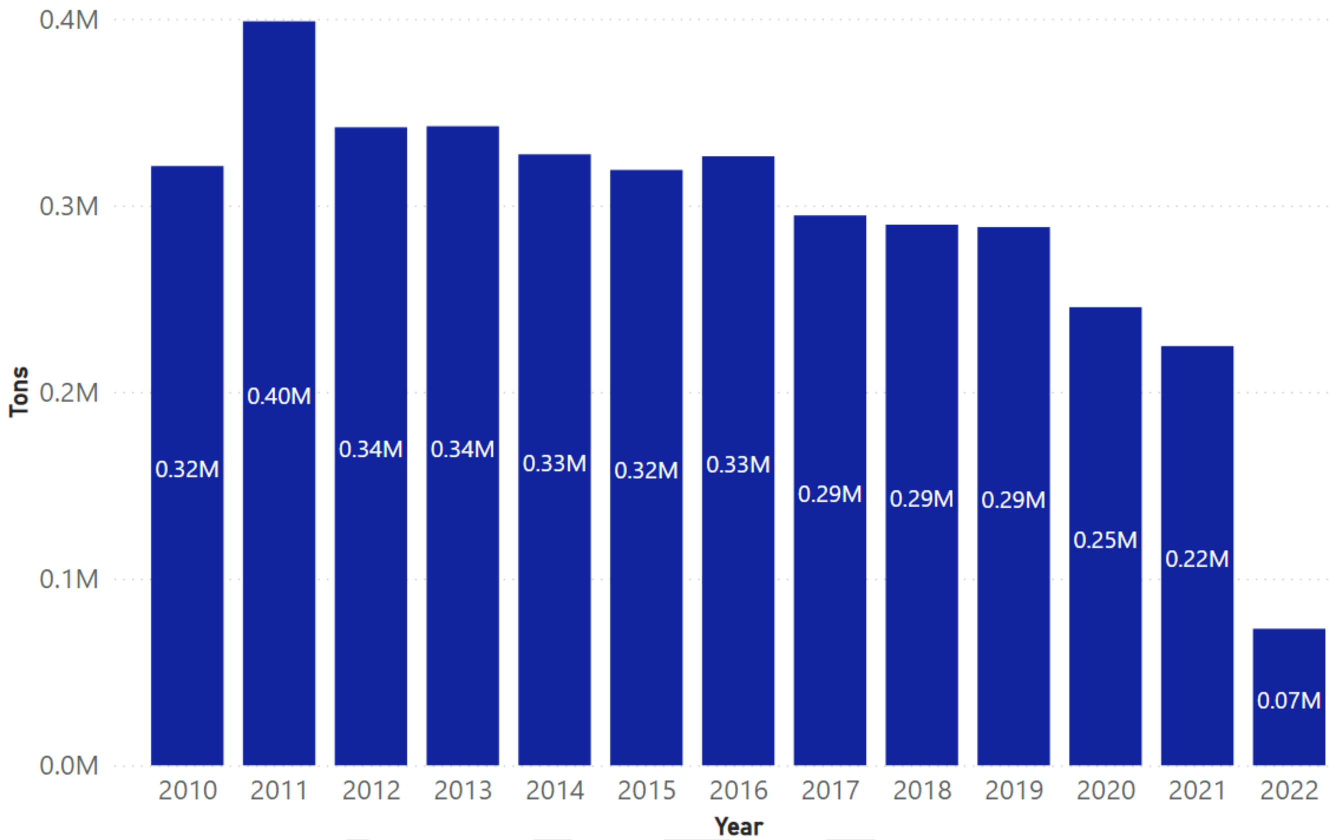

Figure 3.1-32: Annual Amount of RCRA Manifested Hazardous Waste (January 2010 to May 2022)

Most of California's RCRA hazardous waste is managed outside the state. Since 2010, approximately 62 percent of California's manifested RCRA hazardous waste (2.3 million tons) was managed outside the state, and the remaining 38 percent (1.45 million tons) was managed within California (Figure 3.1-32).

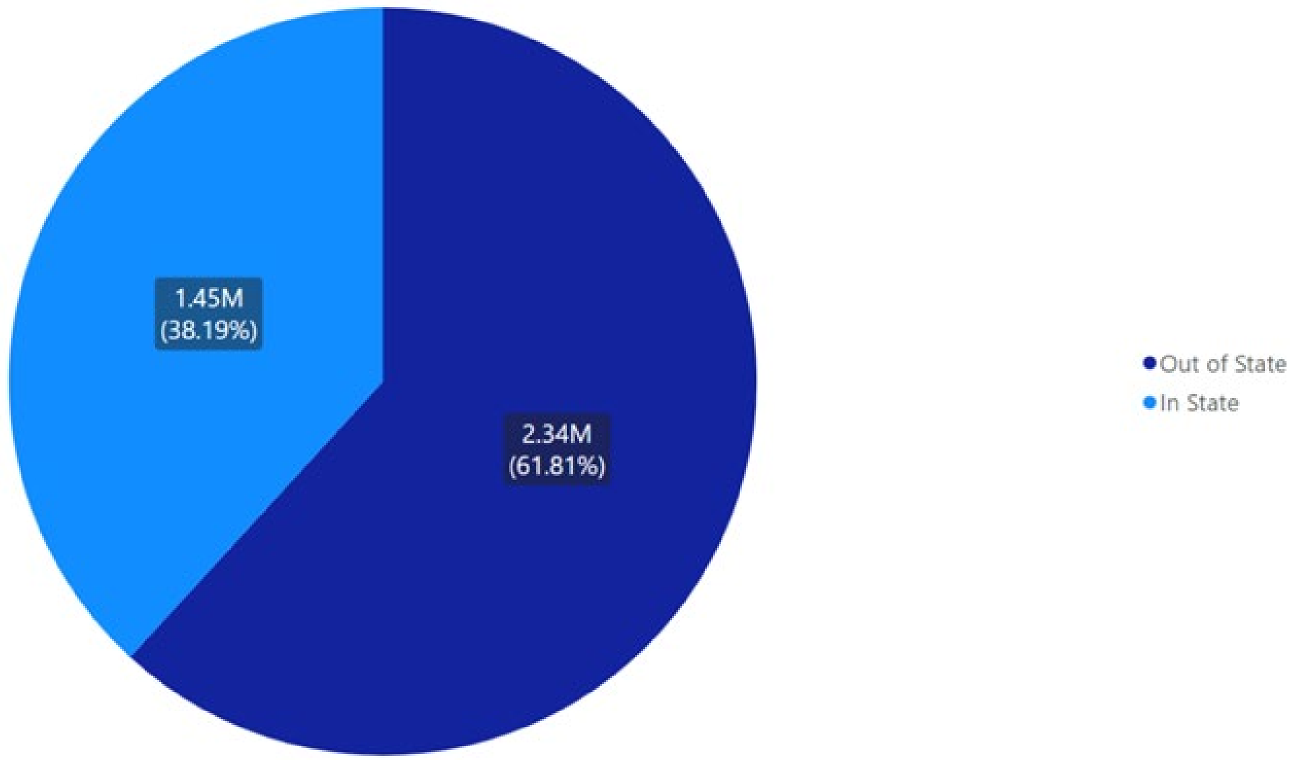

Figure 3.1-33: Management Location of California's Manifested RCRA Hazardous Waste, tons

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

Since 2010, California's manifested RCRA hazardous waste has been managed in 40 other states (Figure 3.1-33). The three states that have received the most manifested RCRA hazardous waste from California are:

- Nevada: 0.91 million tons (24.5%),
- Utah: 0.34 million tons (9.2%), and
- Kansas: 0.15 million tons (4.0%).

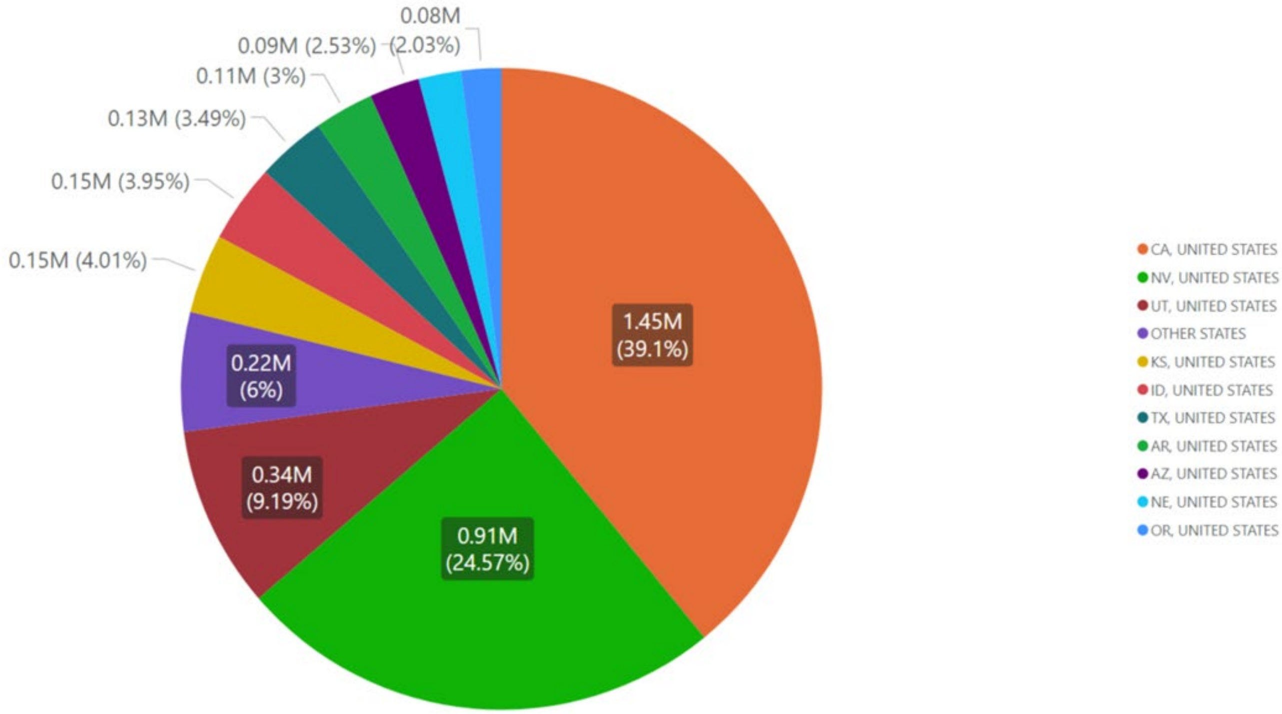

Figure 3.1-34: California's RCRA Manifested Hazardous Waste Managed in Each State, tons

The types of waste shipped to each state for management vary because different types are managed differently, and available management methods vary from state to state. For example, there are no hazardous waste incinerators in California, Utah is the nearest state that has a commercial incinerator, and most of the RCRA hazardous waste types shipped to Utah are those that are required to be incinerated.

3.1.6 Amount of Hazardous Waste Regulated only in California (non-RCRA)

In accordance with Health and Safety Code § 25135(b)(1)(F), the following information quantifies the amount of non-RCRA manifested hazardous waste – that is, waste that is identified as hazardous only in California.

Since 2010, California has generated 21.05 million tons of manifested hazardous waste. Approximately 81 percent of that (17.02 million tons) has been non-RCRA hazardous waste. Generation of manifested non-RCRA hazardous waste averaged 1,389,800 tons per year and ranged between 1,091,200 tons and 1,680,300 tons per year (Figure 3.1-34).

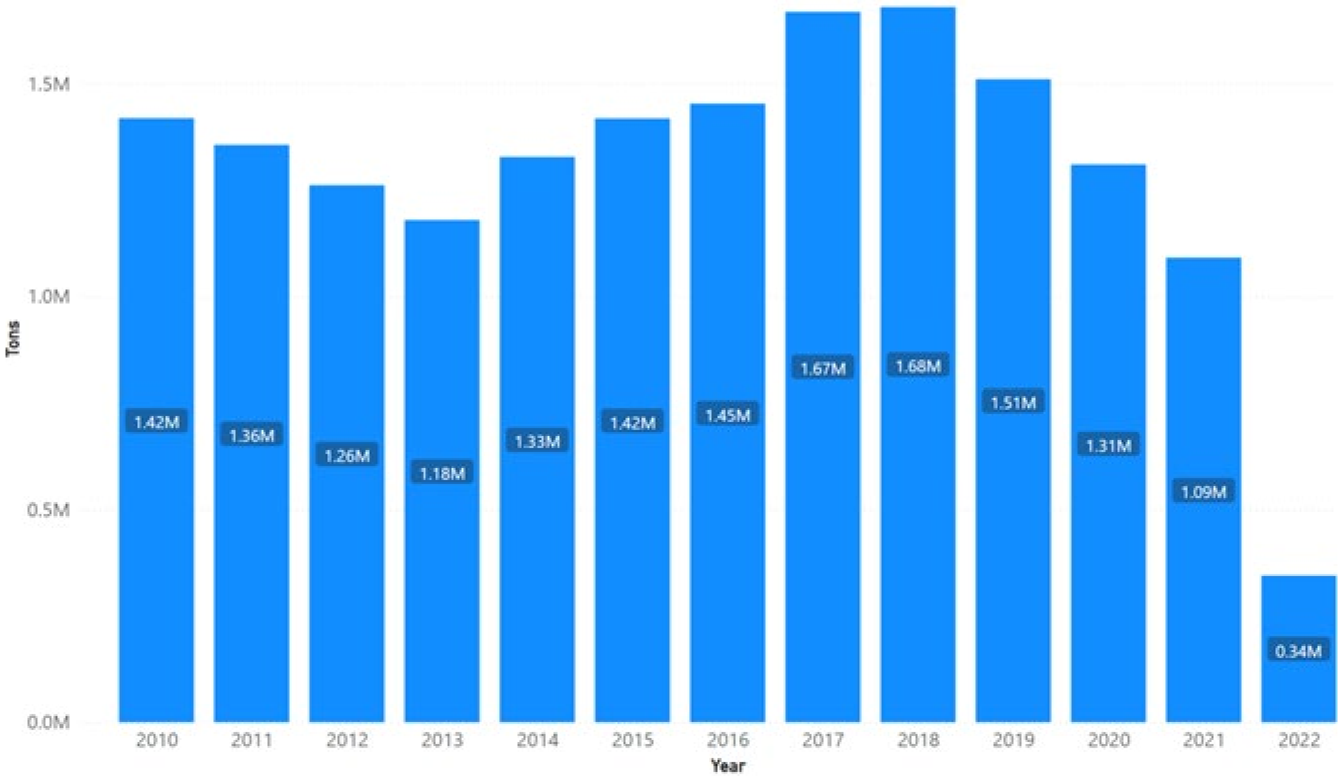

Figure 3.1–35: Annual Generation of Non-RCRA Hazardous Waste

Just over half of California's non-RCRA hazardous waste has been managed in California. Since 2010, 9.65 million tons (56.7%) of non-RCRA hazardous waste has been managed in California, and 7.37 million tons (43.3%) has been managed out of state. This can be seen in figure 3.1-35.

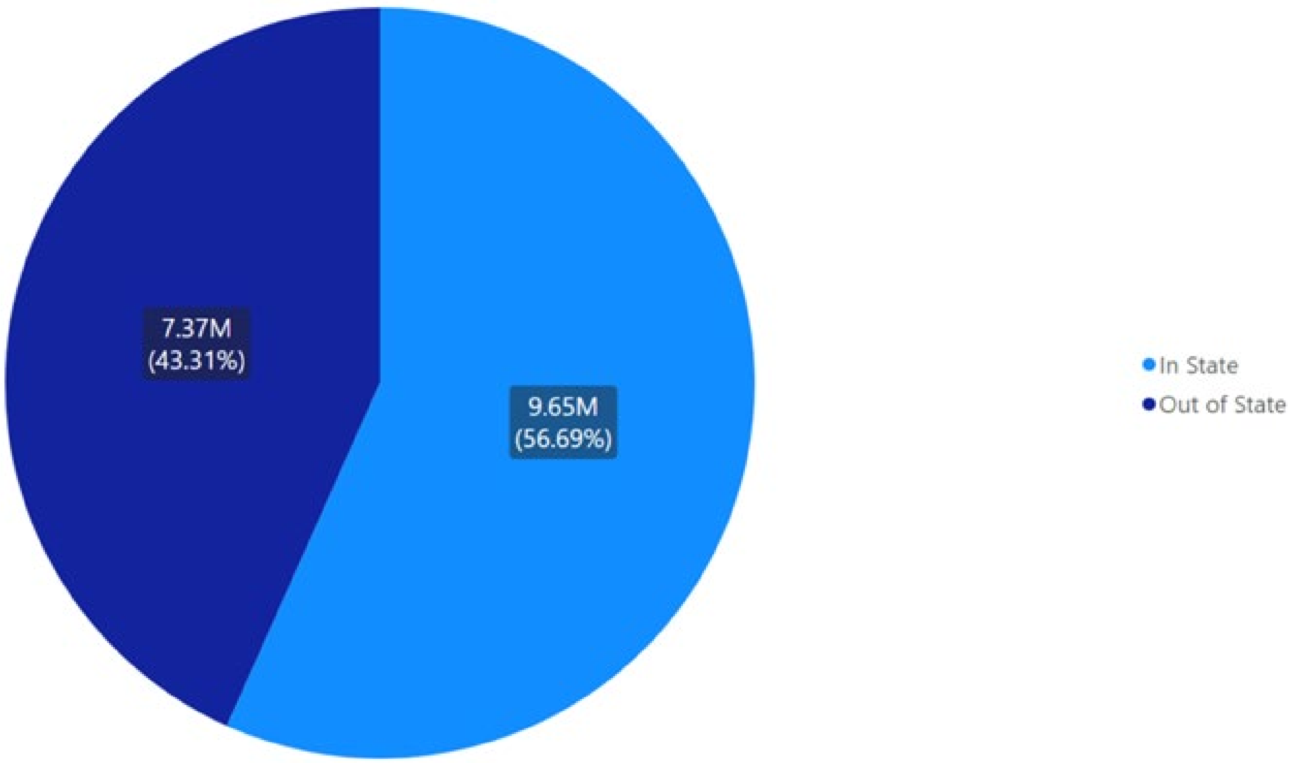

Figure 3.1-36: Breakdown of non-RCRA Hazardous Waste Management in California vs Out of State, tons

Note: Data sourced from Hazardous Waste Tracking System after data validation methods. Data range January 1, 2010, through May 5, 2022.

Forty-two other states have managed California's manifested non-RCRA hazardous waste (Figure 3.1-36). The three states that have received the most manifested non-RCRA hazardous waste from California are:

- Utah: 2,804,600 tons (16.6%),
- Arizona: 2,687,100 tons (15.9%), and
- Nevada: 1,236,600 million tons (7.3%).

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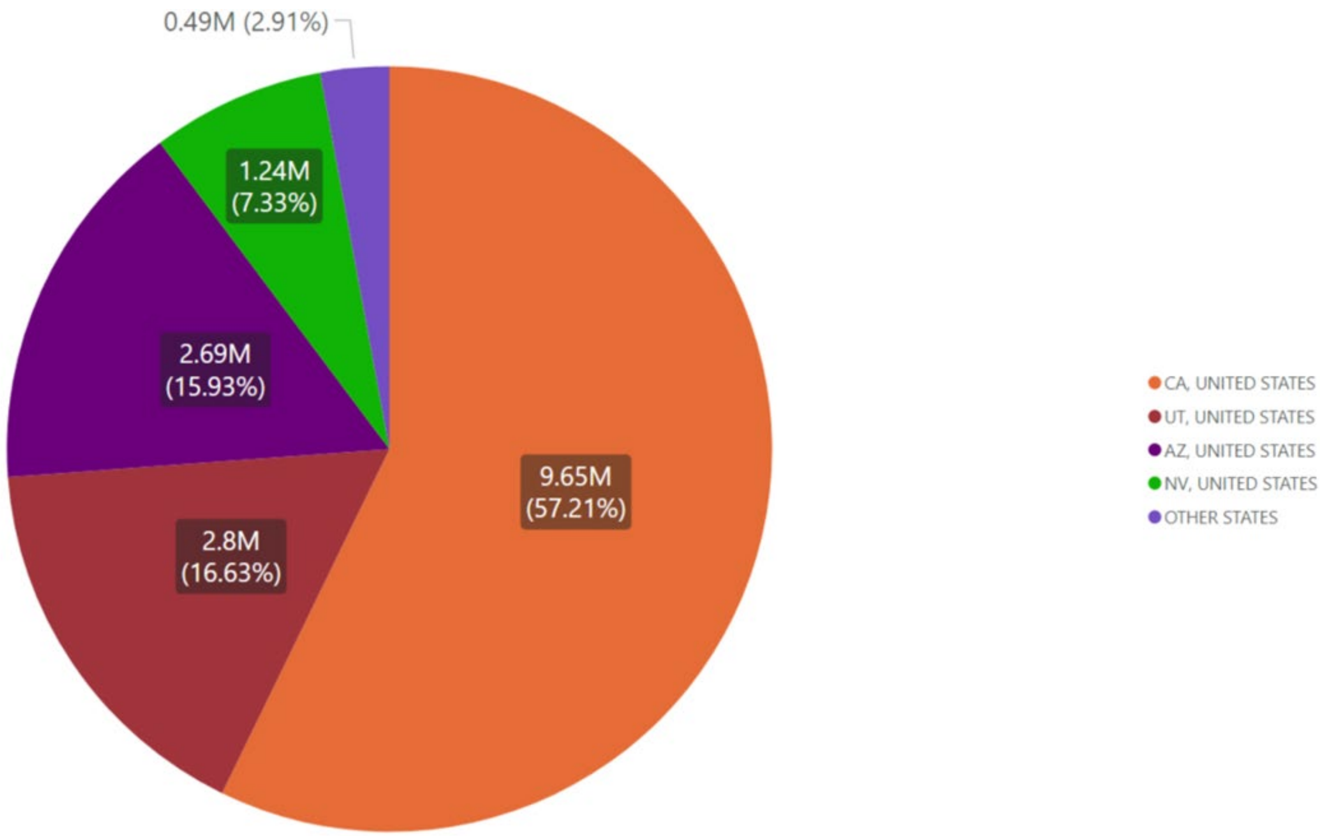

Figure 3.1-37: Breakdown of California's non-RCRA Manifested Hazardous Waste Being Managed in Each State, tons

The types of non-RCRA waste shipped to each state for management did not vary as much as with RCRA hazardous waste. For example, 91.3 percent of non-RCRA hazardous waste shipped to Utah was either Contaminated Soil from Site Cleanups (State Waste Code 611), Other Inorganic Solid Waste (State Waste Code 181), or Unspecified Oil-Containing Waste (State Waste Code 223). California shipped a similar distribution of non-RCRA hazardous waste to Arizona and to Nevada.

Utah has received 2,804,600 tons of non-RCRA hazardous waste since 2010. Contaminated soil made up 84 percent (2,350,000 tons). The primary method of managing California's non-RCRA hazardous waste in Utah is landfilling at 2,696,600 tons (95%).

One facility in Utah (ECDC Environmental) managed 93 percent of the non-RCRA hazardous waste shipped to that state from California. ECDC Environmental is a non-hazardous Subtitle D landfill that appears in HWTS under two EPA ID Numbers: UTC093012201 and UTR000000687. California's non-RCRA hazardous waste is typically not required to be managed as hazardous waste in other states.

The types of non-RCRA wastes shipped to Arizona have a similar makeup as those shipped to Utah. Since 2010, about 69.2 percent of non-RCRA hazardous waste shipped to Arizona have been either Contaminated Soil, Other Inorganic Solid Waste, or Asbestos-Containing waste (State Waste Code 151). The primary method of managing California's non-RCRA hazardous waste in Arizona is landfilling at 1,898,011 tons (71%).

Of the 2,687,100 tons of non-RCRA hazardous waste shipped to Arizona, 828,700 tons (30.8%) were managed at one non-hazardous Subtitle D landfill, South Yuma County Landfill (EPA ID Number: AZR000506980). The next largest receiver of California's non-RCRA hazardous waste in Arizona was La Paz, a non-hazardous Subtitle D landfill that appears in HWTS under two EPA ID Numbers: AZC950823111 and AZR000520882.

The types of non-RCRA wastes managed in Nevada have a similar makeup as those in Utah and Arizona. The top three non-RCRA waste categories shipped to Nevada since 2010 have been Other Inorganic Solid Waste (State Waste Code 181), Other Organic Solids (State Waste Code 352), and Contaminated Soil from Site Cleanups (State Waste Code 611). The primary method of managing California's non-RCRA hazardous waste in Nevada is landfilling at 738,100 tons (59.7%).

Of the 1,236,600 tons of non-RCRA hazardous waste shipped to Nevada, 91 percent (1,125,800 tons) have been managed at –US Ecology Nevada (EPA ID Number: NVT330010000), a Class 1 hazardous waste landfill.

3.2 Universal Waste

3.2.1 Regulated Entities

Destination facilities are fully regulated facilities that treat, dispose of, or recycle a specific kind of universal waste. Examples of destination facilities include hazardous waste treatment and/or recycling facilities and hazardous waste landfills.

A destination facility is required to operate under a hazardous waste facilities permit, unless otherwise noted in California Code of Regulations, Title 22, § 66273.60. Destination facilities must also follow certain rules for shipping universal wastes off site and for rejecting shipments that contain universal waste.[15] In addition, they are required to keep records of all shipments received for three years.[16]

A universal waste handler is a facility that accepts, accumulates, and ships universal waste and is not considered a destination facility.[17]

3.2.2 Electronic Devices

Quantifying the amount of electronic device waste handled and treated in California is difficult. One challenge is associated with the fact that handlers can choose whether to record devices they handle either by weight or by count. Because the sizes of electronic devices vary greatly – a mobile phone vs a television, for example – there is no reliable way to convert a number of devices reported to weight in tons or vice versa.

3.2.2.1 Treated Electronic Devices

Universal waste handlers that handle electronic devices are authorized to conduct certain activities, including, but not limited to, removal, disassembly, and draining activities. They are allowed to remove user-replaceable components such as batteries and ink cartridges,[18] and they may also dismantle or manually segregate components from an electronic device.[19]

Other treatment activities universal waste handlers are allowed to conduct on electronic devices[20] include those that only change the physical properties of the device. This includes sawing, cutting, or shredding, as well as physically separating materials based on differences in physical properties like size, color, and density.

[15] Cal. Code Regs., tit. 22, § 66273.61
[16] Cal. Code Regs., tit. 22, § 66273.62
[17] "DTSC Universal Waste Fact Sheet." *Dtsc.ca.gov*, State of California, Jan. 2010, Website Link.
[18] Cal. Code Regs., tit. 22, § 66273.71(b)
[19] Cal. Code Regs., tit. 22, § 66273.72(c)(1)(a)
[20] Cal. Code Regs., tit. 22, § 66273.73(d)

Treatment activities can make it difficult to accurately quantify electronic device waste, because handlers can record devices either by weight or by count (number of devices). For example, a handler may submit an annual report to DTSC listing a certain number of devices but then dismantle those devices into separate categories of waste, like plastic, metal, and battery packs. The handler may then ship those separate wastes to another handler or destination and list the materials by weight. In the end, the same materials can be listed in one report as a single electronic device and in another report as 4 pounds of plastic, 12 pounds of metal, and 3 pounds of battery pack (unspecified universal waste). Figure 3.2-1 illustrates how a single electronic device can be broken down into multiple components.

A further challenge to quantifying electronic device waste is presented when a waste is refurbished. A refurbished electronic device is no longer considered a waste, so it is not included in the handler's annual report.

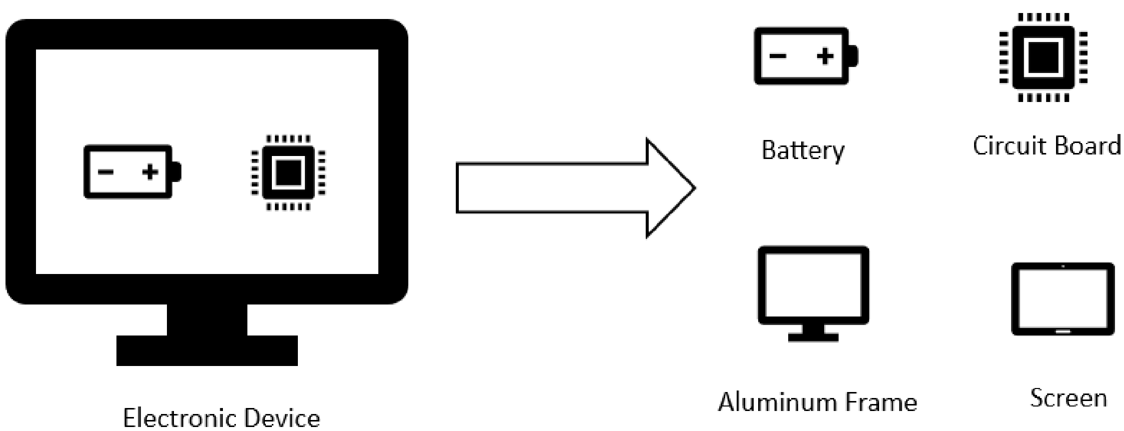

Figure 3.2-1: Electronic Device Broken into Components

Figure 3.2-2 shows treated electronic devices by weight (tons) in 2021 by county. About 59,410 tons of electronic devices were treated in California in 2021. Fresno County treated 15,170 tons (26%), San Bernardino County treated 11,270 tons (19%), and Orange County treated 9,880 tons (17%). Table 3.2-1 shows treated electronic devices by weight (tons) by county in 2021 in tons.

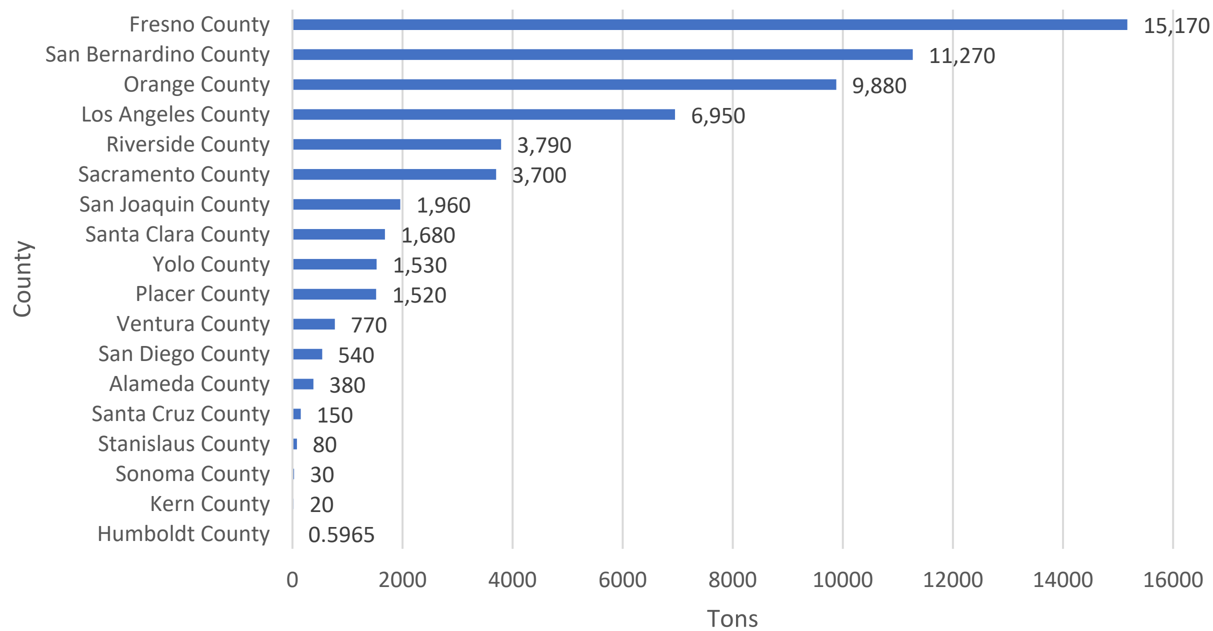

Figure 3.2-2: Treated Electronic Devices by County, Tons, 2021

Figure 3.2-3 shows treated electronic devices by count in 2021 by county. Only two counties recorded devices by count. Of the 32,720 electronic devices recorded in California in 2021, handlers in Alameda County treated 31,890 of them (97%) and handlers in San Diego County treated 830 (3%). There is no reliable conversion to determine the weight of electronic devices that are recorded by count because device sizes vary so greatly. Table 3.2-1 shows treated electronic devices by count in 2021 by county.

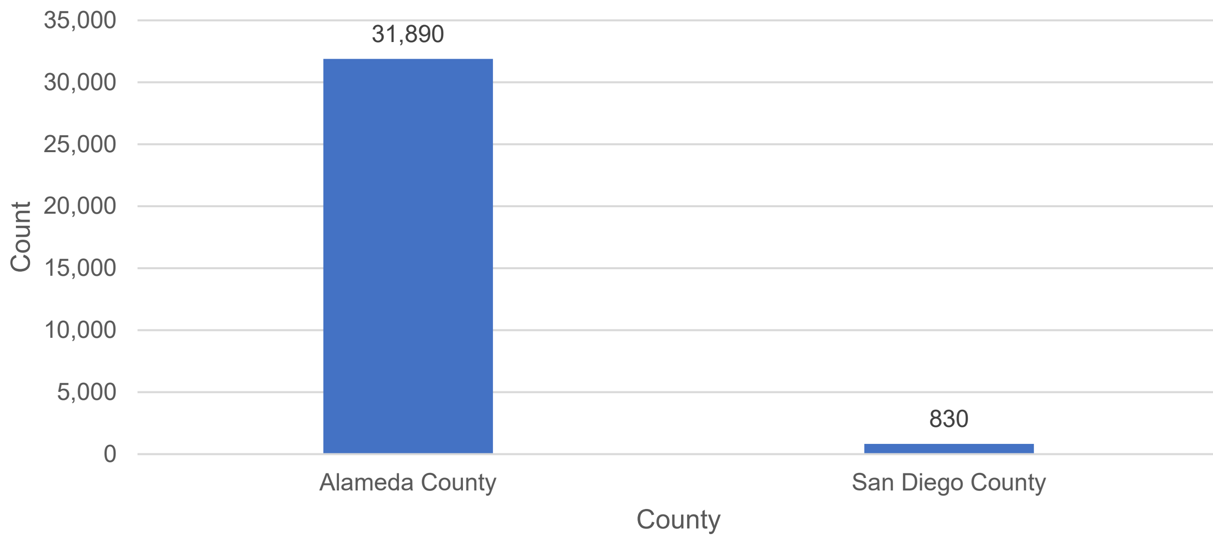

Figure 3.2-3: Count of Treated Electronic Devices by County, 2021

3.2.2.2 Destinations of Electronic Devices

Universal waste handlers can send waste either to another handler or to a destination facility[21] and must record the amount shipped in an annual report.[22] Handlers include the name, address, and phone number of the entity receiving the universal waste, but they are not required to report the types of activities conducted at those locations, so DTSC lacks that information.

Figure 3.2-4 shows the countries that received electronic devices from California in 2021. California handlers shipped about 41,600 tons of electronic devices to seven other countries in 2021. About 29,040 tons (70%) of electronic devices went to a location within the United States, about 5,670 tons (14%) were shipped to Indonesia, and about 2,670 tons (6%) went to Mexico. Table 3.22 shows destinations of electronic devices shipped from California in 2021.

[21] Cal. Code Regs., tit. 22, § 66274.38(a)

[22] In UWED, this is called a destination, not a destination facility.

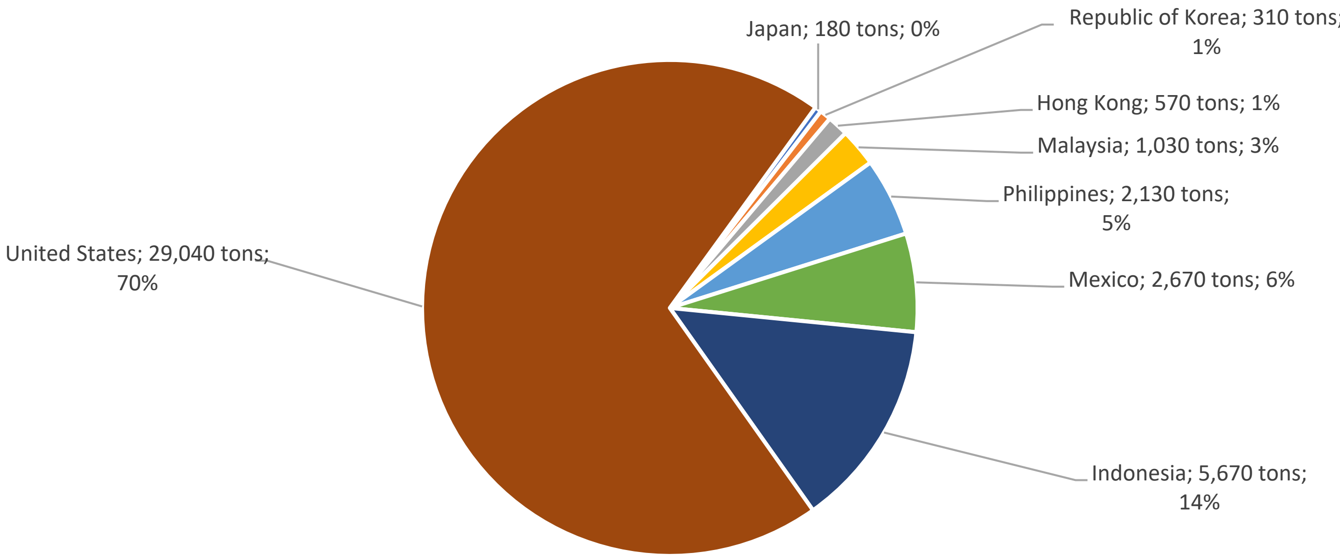

Figure 3.2-4: Destinations of Electronic Devices by Country, Tons, 2021

Figure 3.2-5 shows the states that received electronic devices from California in 2021. California handlers shipped about 29,040 tons of electronic devices to destinations in t25 states, including California. About 19,540 tons (67%) of electronic devices went to destinations within California, about 3,970 tons (14%) were shipped to Arizona, and about 1,190 tons (4%) went to Nevada. Table 3.2-3 shows the states that received electronic devices from California in 2021.

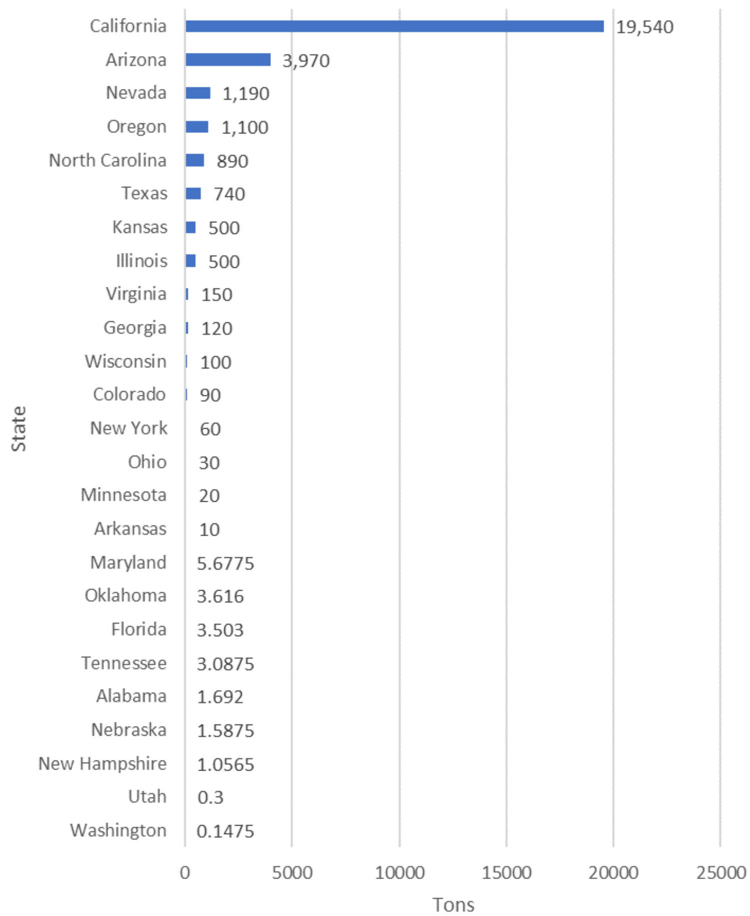

Figure 3.2--5: Destinations of Electronic Devices by State, Tons, 2021

Figure 3.2-6 shows the California counties that received electronic devices in 2021 by weight. California handlers shipped about 19,540 tons of electronic devices to destinations in21 counties. Fresno County destinations received 8,010 tons (41%) of shipped electronic devices, Los Angeles County destinations received 2,760 tons (14%), and San Bernardino County destinations received 2,570 tons (13%). Table 3.2--4 shows destination counties of electronic devices.

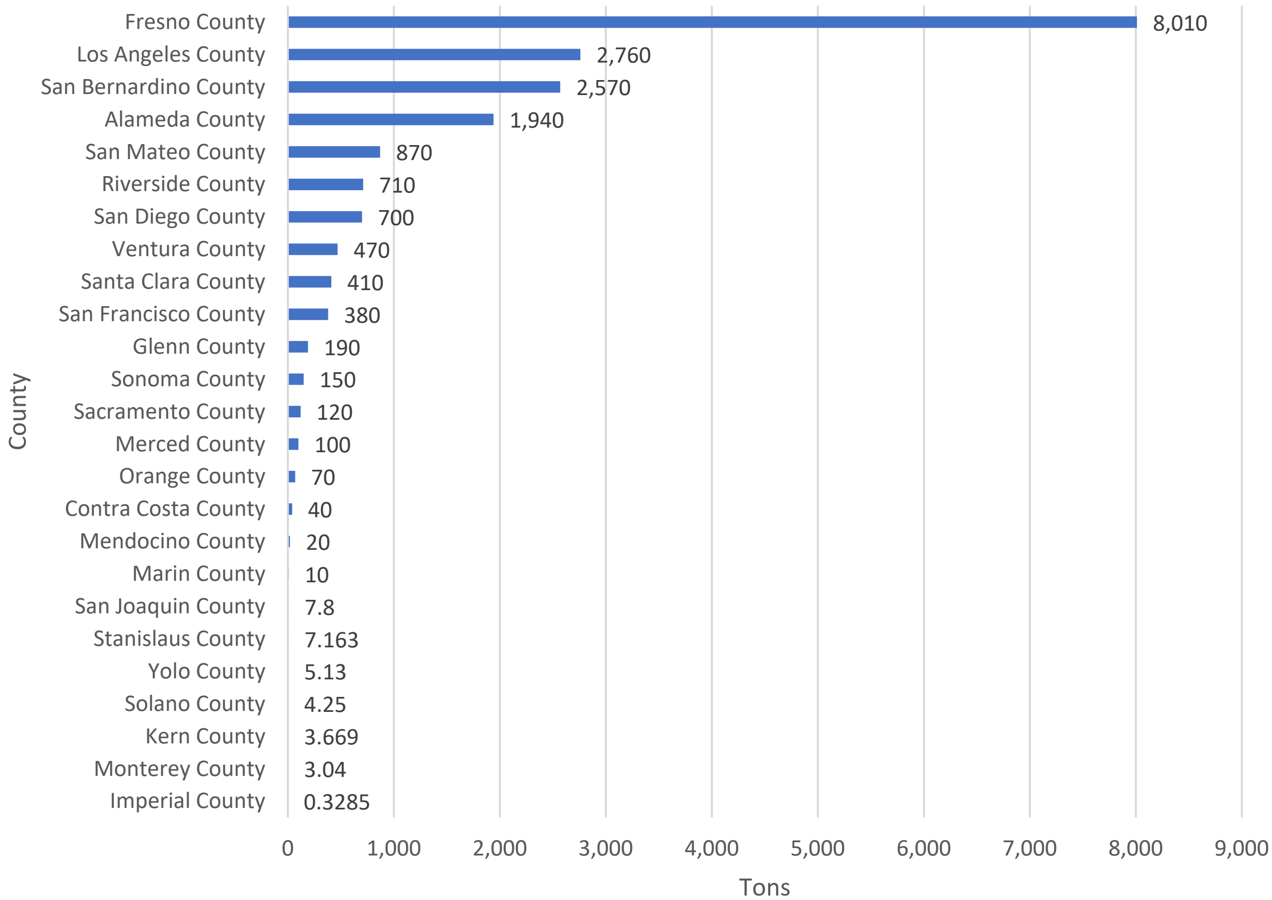

Figure 3.2-6: Destinations of Electronic Devices by County, Tons, 2021

Figure 3.2-7 shows the California counties that recorded electronic devices received by count in 2021. Of the 27,790 electronic devices recorded as being shipped to a destination in California, Monterey County destinations received 17,740 devices (64%), Fresno County destinations received 4,450 (16%), and Los Angeles County destinations received 2,200 devices (8%). Table 3.24 shows the destination counties of electronic devices.

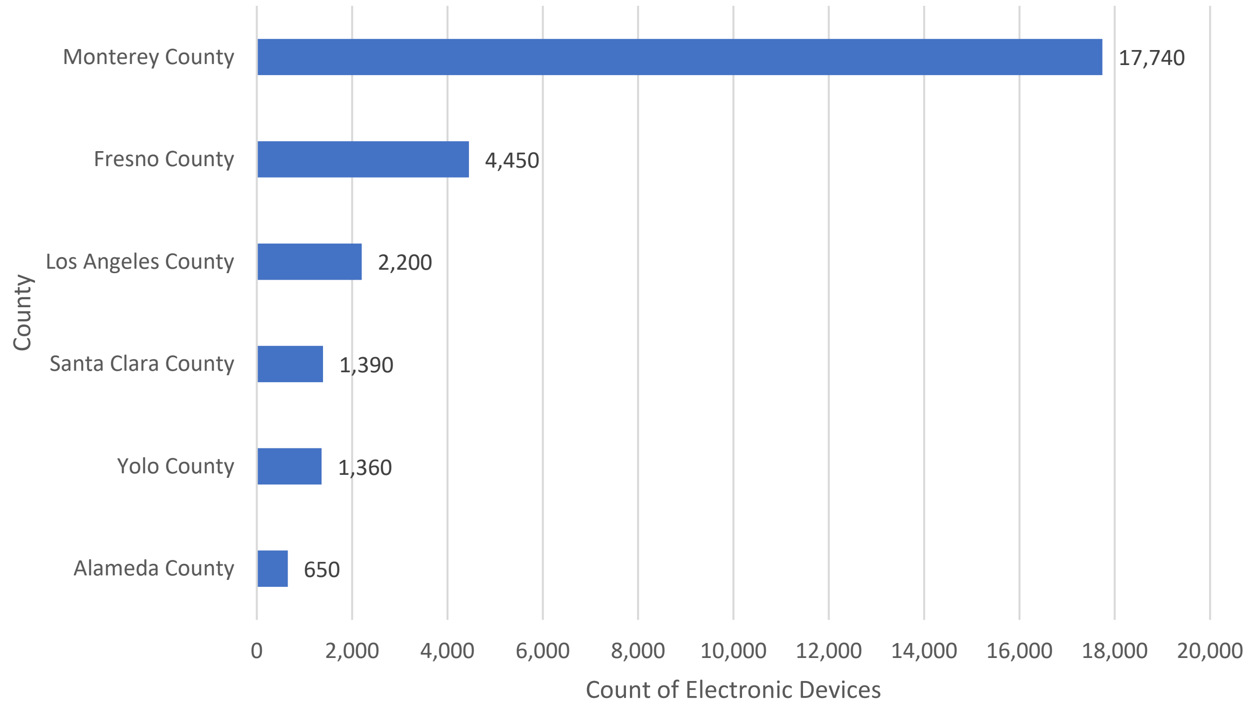

Figure 3.2-7: Destinations of Electronic Devices by County, by Count, 2021

3.2.3 Cathode Ray Tube (CRT) Devices

3.2.3.1 Treated CRT Devices

Universal waste handlers that handle Cathode Ray Tube (CRT) devices can either ship the devices to other facilities for treatment or treat them themselves. Handlers are authorized to remove CRTs from devices as long as it is done in a manner that prevents the CRT from breaking.[23]

Figure 3.2-8 shows the California counties where CRT devices were treated in 2021. Of the 18,180 tons of CRT devices treated, recyclers in Los Angeles County treated 4,410 tons (24%), recyclers in San Bernardino County treated 3,010 tons (17%), and recyclers in Riverside County treated 2,410 tons (13%). While some counties recorded CRT devices by count in annual reports, the HWPlan unit was able to convert these numbers to weight because CRT devices are more uniform in size than other electronic devices. The team multiplied the number of devices by 50 to arrive at a weight in pounds for counties that reported CRT devices by count.[24] Table 3.2-1 shows treated CRT devices by county in 2021 in tons.

[23] Cal. Code Regs., tit. 22, § 66273.72(b)(1)
[24] 50 is used for the weight of a CRT device to convert count of devices to weight.

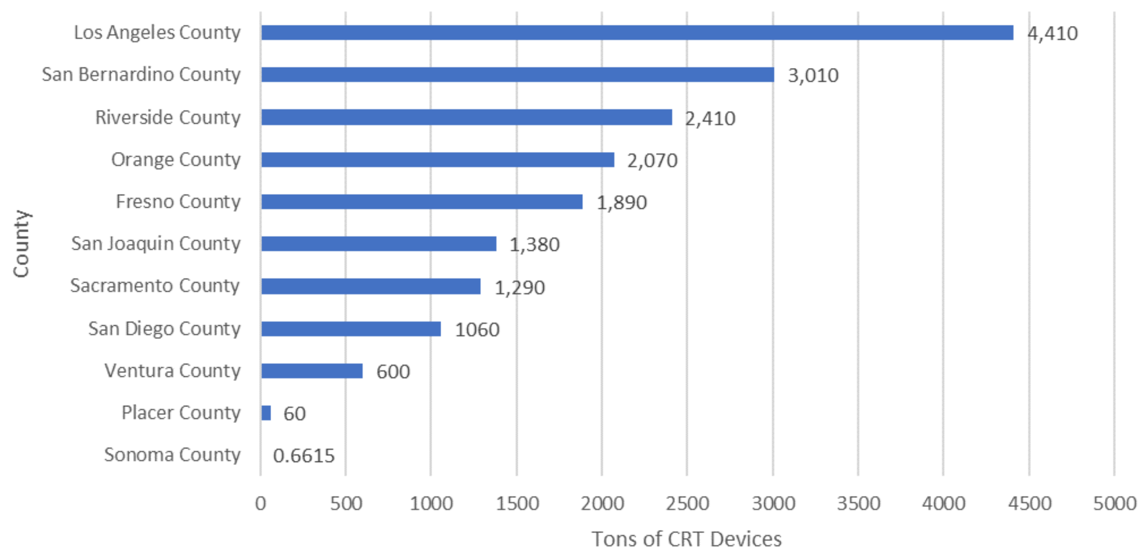

Figure 3.2-8: CRT Devices Treated by County, Tons, 2021

3.2.3.2 Destinations of CRT Devices

Figure 3.2-9 shows the countries that received CRT devices from California in 2021. California handlers shipped 2,810 tons of CRT devices to destinations in two countries in 2021. About 1,820 tons (65%) of California's CRT devices went to destinations within the United States, and about 990 tons (35%) went to destinations in Mexico. Table 3.2-2 shows destinations of CRT devices in tons by country in 2021.

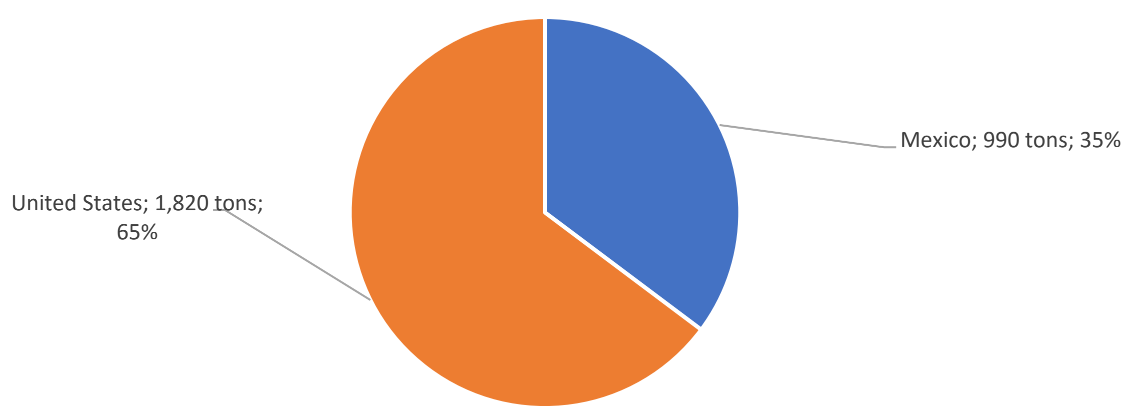

Figure 3.2-9: Destinations of CRT Devices by Country, Tons, in 2021

Figure 3.2-10 shows the states that received CRT devices from California in 2021. Of the 1,820 tons of CRT devices shipped to destinations within the United States in 2021, about 1,800 tons (99%) went to destinations within California. Oregon, Arizona, Texas, Illinois, and Arkansas each received less than 10 tons of CRT devices from California. Table 3.2-3 shows destinations of CRT devices by state in tons in 2021.

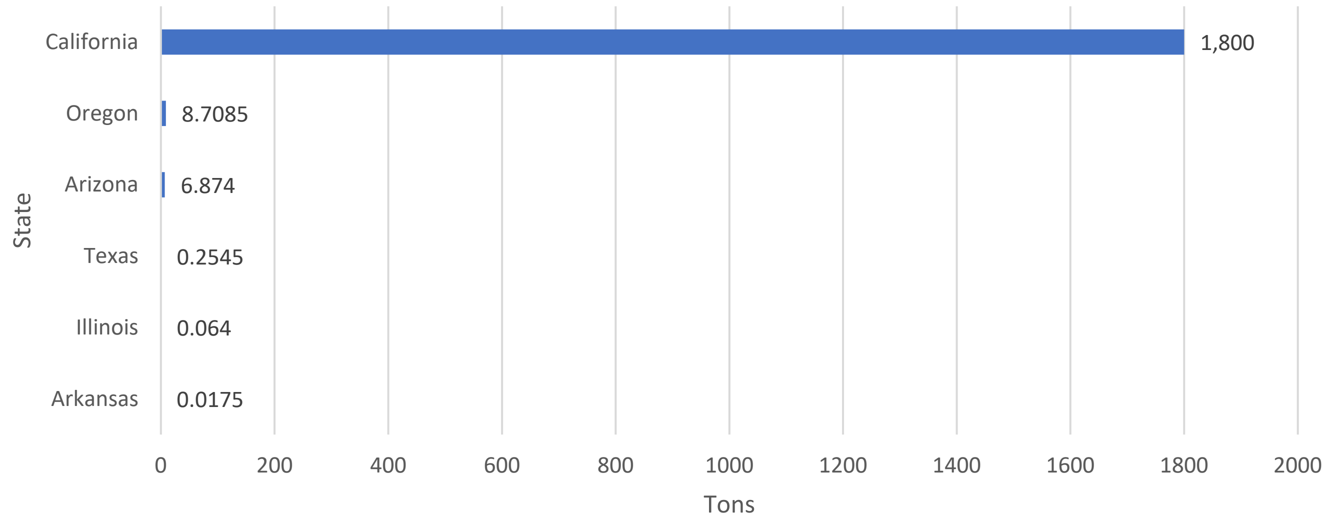

Figure 3.2-10: Destinations of CRT Devices by State, Tons, 2021

Figure 3.2-11 shows the California counties that handlers sent CRT devices to in 2021. Of the 1,800 tons of CRT devices shipped within California in 2021, about 860 tons (46%) went to destinations in Fresno County, about 400 tons (22%) went to destinations in Alameda County, and about 140 tons (8%) were shipped to destinations in Los Angeles County. Table 3.2-4 shows destinations of CRT devices in tons by county in 2021.

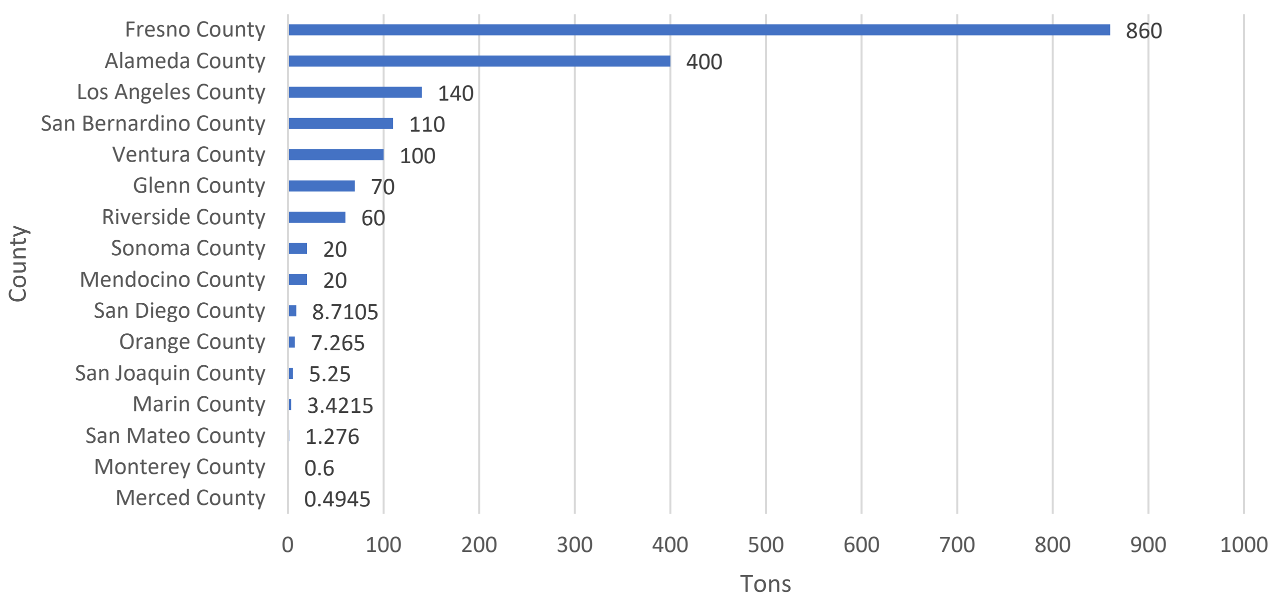

Figure 3.2-11: Destinations of CRT Devices by County, Tons, 2021

3.2.4 Cathode Ray Tubes (CRTs)

3.2.4.1 Treated CRTs

Universal waste handlers that handle CRTs and CRT glass are authorized to conduct certain treatment activities including:[25]

- physical treatment that changes only the physical properties of the CRT[26]
- physical separation based on differences in physical properties[27]
- use of a pinpoint torch or hot wire to check CRTs for glass separation[28]
- physical separation of CRT panel glass[29] from CRT funnel glass[30] for the disposal of CRT panel glass into a CRT glass approved landfill[31]
- physical separation of CRT panel glass from CRT funnel glass for the management of CRT panel glass pursuant to HSC § 25143.2.5[32]

These treatments are not authorized if they use chemicals, including water, and/or external heat.[33]

Figure 3.2-12 shows treated CRTs by county in California in 2021. Of the 1,860 tons of CRTs treated in California in 2021, about 800 tons (43%) were treated by San Bernardino County recyclers, about 740 tons (40%) were treated by Sacramento County recyclers, and about 320 tons (17%) were treated by Ventura County recyclers. Table 3.2-4 shows treated CRTs in tons by county in 2021.

[25] Cal. Code Regs., tit. 22, § 66273.73(b)(2)
[26] Cal. Code Regs., tit. 22, § 66273.73(d)(1)(A)
[27] Cal. Code Regs., tit. 22, § 66273.73(d)(1)(B)
[28] Cal. Code Regs., tit. 22, § 66273.73(d)(1)(C)
[29] The face plate of a CRT, which contains a viewing surface.
[30] Any glass of a CRT separated from panel glass.
[31] Cal. Code Regs., tit. 22, § 66273.73(d)(1)(E)
[32] Cal. Code Regs., tit. 22, § 66273.73(d)(1)(F)
[33] Cal. Code Regs., tit. 22, § 66273.73(d)(2)(A)

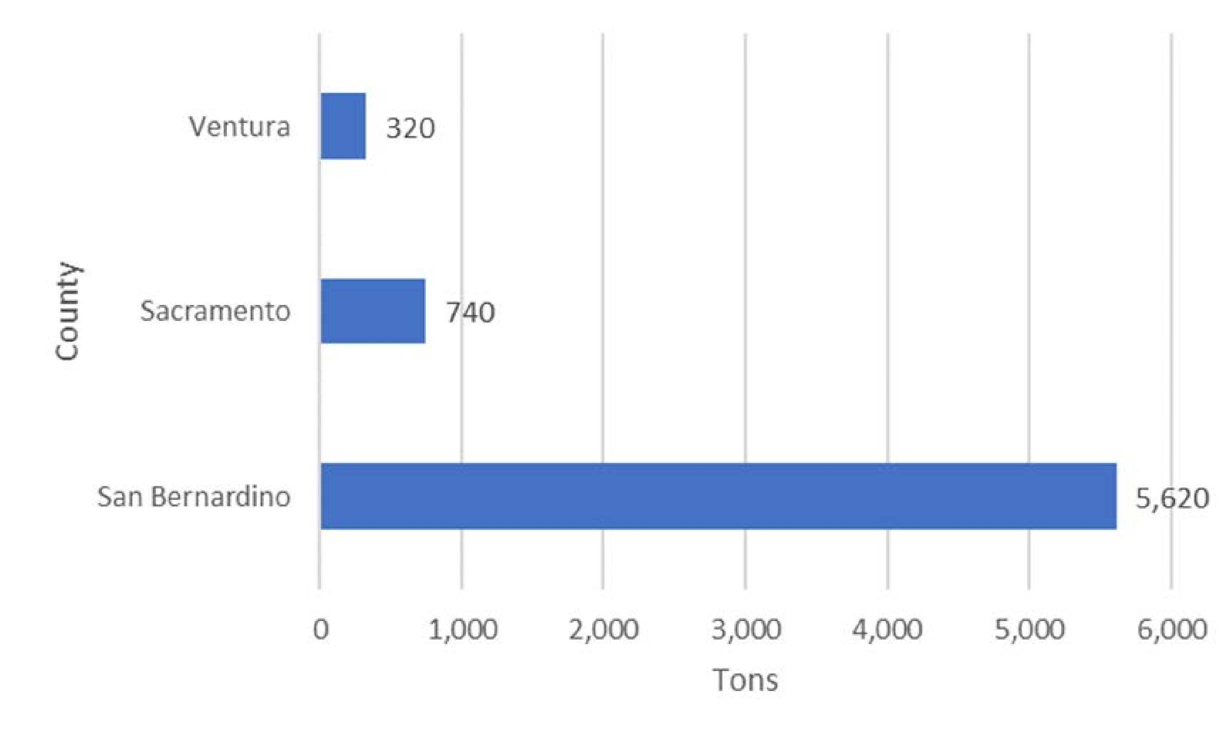

Figure 3.2-12: CRTs Treated by County, Tons, 2021

3.2.4.2 Destinations of CRTs

Universal waste handlers have five options for the disposition of waste CRTs and CRT glass:[34]

1. Send CRTs and CRT glass for recycling through CRT glass manufacturing or primary/secondary lead smelting.
2. Send CRTs and CRT glass to an intermediate facility for further processing.
3. Dispose of tested CRT panel glass in a CRT panel glass approved landfill, if certain requirements are met.[35]
4. Recycle CRT panel glass that only exceeds the Total Threshold Limit Concentration (TTLC)[36] for barium; this recycled CRT panel glass is no longer considered a waste.
5. Manage CRTs and CRT glass as hazardous waste by disposing of them at a permitted hazardous waste facility.

Figure 3.2-13 shows countries that received CRTs from California in 2021. California handlers shipped about 12,530 tons of CRTs to two countries in 2021. About 8,940 tons (71%) went to Mexico, while about 3,590 tons (29%) went to destinations within the United States. Table 3.2-2 shows destinations of CRTs in tons by country in 2021.

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[34] Department of Toxic Substances Control. *Final Disposition Options for Universal Waste: Cathode Ray Tubes and CRT Glass*

[35] Cal. Code Regs., tit. 22, § 66273.75(a)(9) and § 66273.75(f)(2)

[36] Total Threshold Limit Concentration

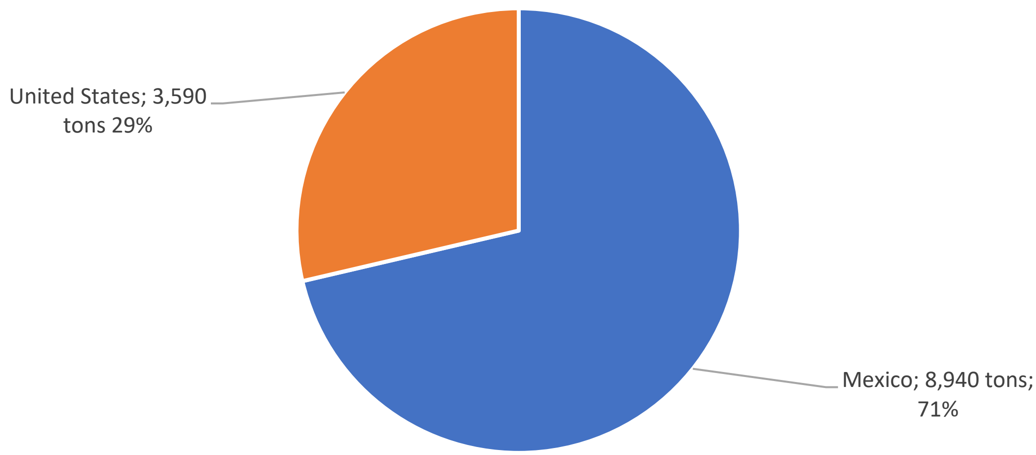

Figure 3.2-13: Destinations of CRTs by Country, Tons, 2021

Figure 3.2-14 shows the states California handlers shipped CRTs to in 2021. Of the 3,590 tons of CRTs shipped within the United States in 2021, about 2,800 tons (79%) went to destinations in Nevada, about 700 tons (20%) went to destinations in Missouri, and about 90 tons (3%) went to destinations within California. Table 3.2-3 shows destinations of CRTs in tons by state in 2021.

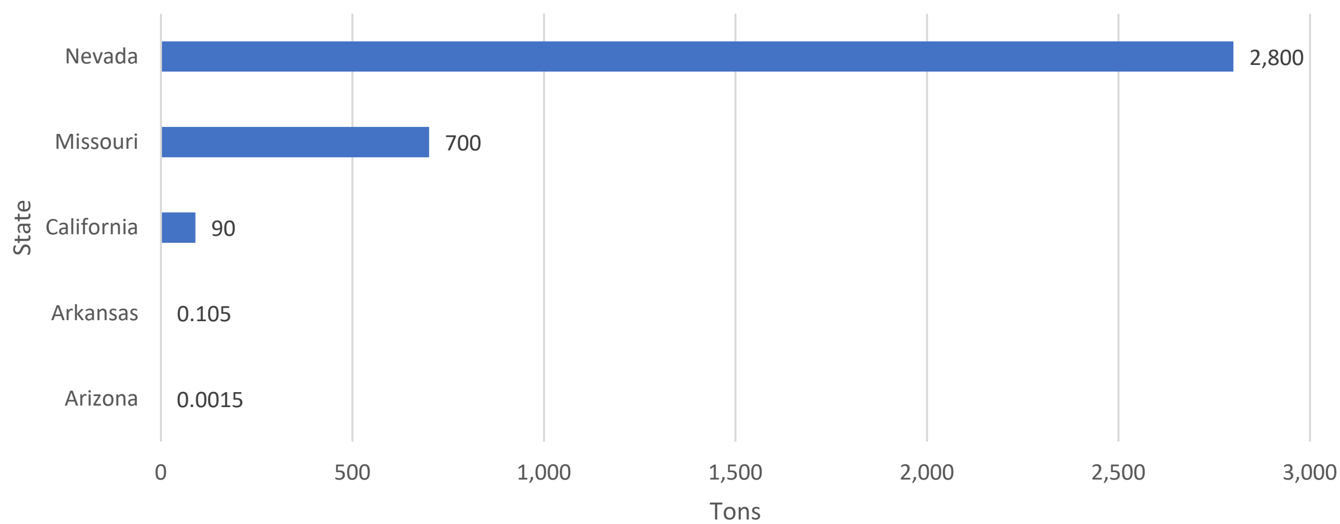

Figure 3.2-14: Destination of CRTs by State, Tons, 2021

Figure 3.2-15 shows the California counties that handlers shipped CRTs to in 2021. Of the 90 tons of CRTs that were shipped within California in 2021, about 60 tons (67%) went to destinations in Fresno County, and about 30 tons (33%) went to destinations in Alameda County. Table 3.2-4 shows destinations of CRTs in tons by county in 2021.

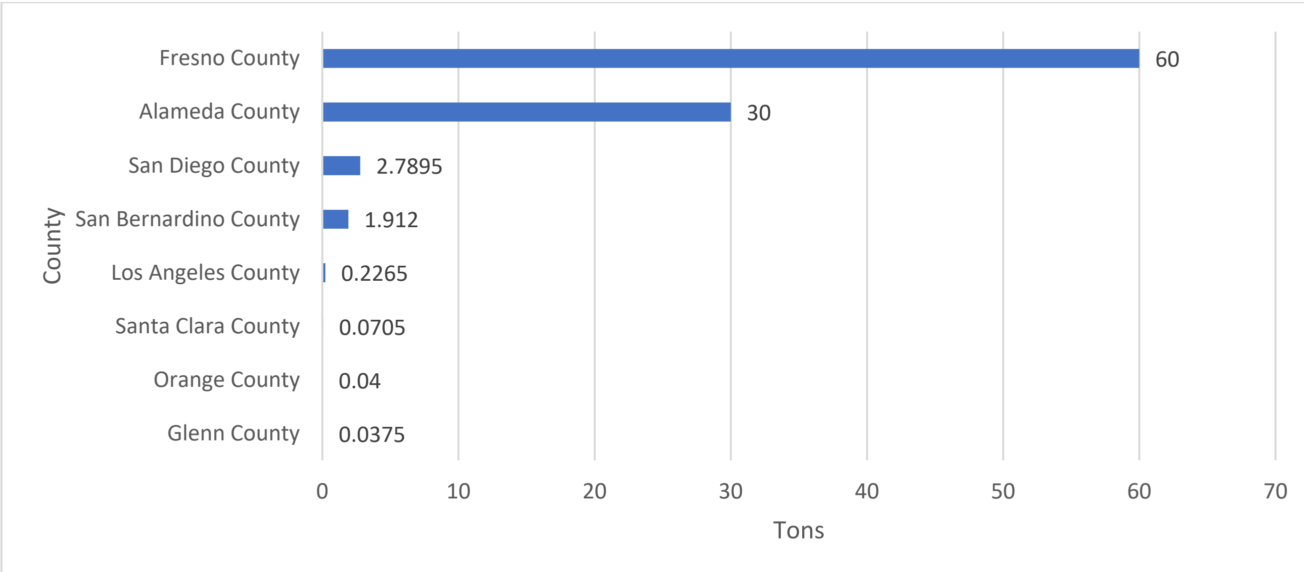

Figure 3.2-15: Destinations of CRTs by County, Tons, 2021

3.2.5 CRT Glass

CRT glass is handled separately from CRTs when it has been separated from CRTs either because of treatment or breakage.

3.2.5.1 Treated CRT Glass

No CRT glass was treated in California in 2021.

3.2.5.2 Destinations of CRT Glass

CRT glass may come from accidental breakage of a CRT or from treatment of a CRT. CRT glass shipped to a destination out of state in 2021 was greater than the amount handled in California. This may be because some CRT glass originated from handlers that treated CRTs.

Figure 3.2-16 shows the countries that received CRT glass from California in 2021. Of the 3,270 tons of CRT glass shipped in 2021 about 1,850 tons (56%) went to destinations within the United States, about 870 tons (27%) was shipped to South Korea,[37] and about 560 tons (17%) went to Mexico. Table 3.2-2 shows destinations of CRT glass in tons in 2021.

[37] May be recorded in UWED data as the Republic of Korea or Democratic People's Republic of Korea.

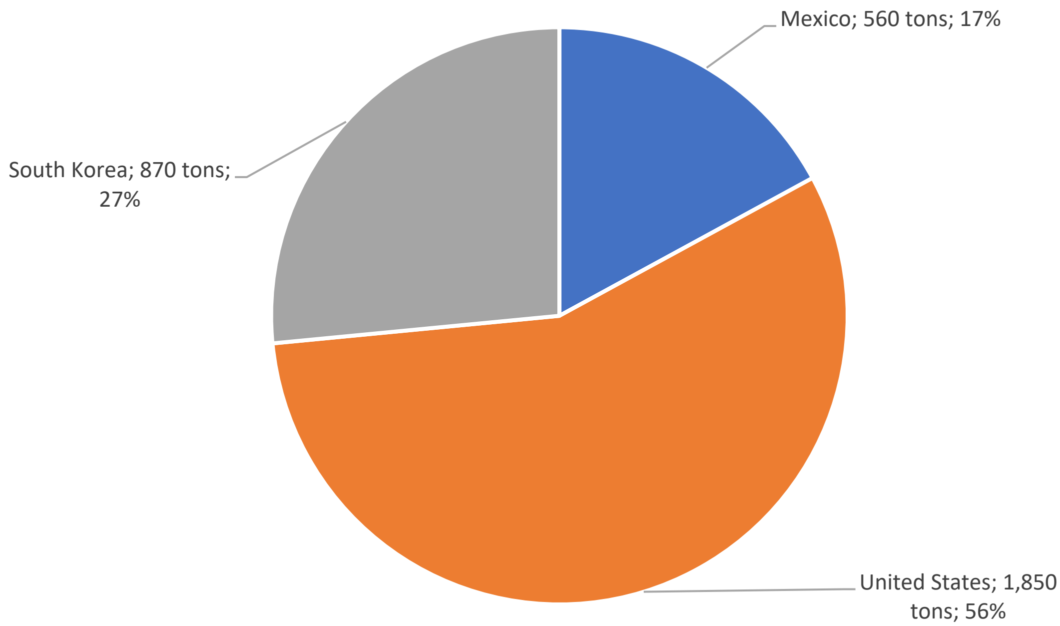

Figure 3.2-16: Destinations of CRT Glass by Country, Tons, 2021

Figure 3.2-17 shows the states that received CRT glass from California in 2021. Of the 1,850 tons of CRT glass shipped to destinations within the United States in 2021, 1,110 tons (60%) went to destinations in Nevada, 740 tons (40%) went to destinations in Missouri, and less than one ton went to destinations in Arizona. CRT glass was not shipped to destinations in California in 2021. Table 3.23 shows destinations of CRT glass in tons by state in 2021.

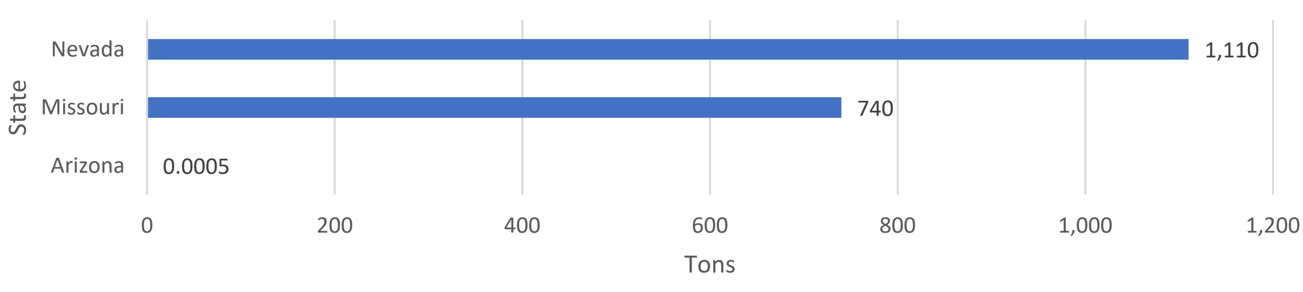

Figure 3.2-17: Destinations of CRT Glass by State, Tons, 2021

3.2.6 Unspecified Universal Waste

When an electronic device is treated, it may be broken down into components, or treatment residuals. These may include universal waste, such as batteries or electric lamps, that are recorded in annual reports as unspecified universal waste.

3.2.6.1 Destinations of Unspecified Universal Waste

Figure 3.2-18 shows the states that received unspecified universal waste from California in 2021. Of the 930 tons of unspecified universal waste shipped in 2021, about 460 tons (49%) went to destinations within California, 150 tons (16%) went to destinations in Nevada, and 90 tons (10%) went to destinations in Ohio. Table 3.2-5 shows destinations of unspecified universal waste in tons by state in 2021.

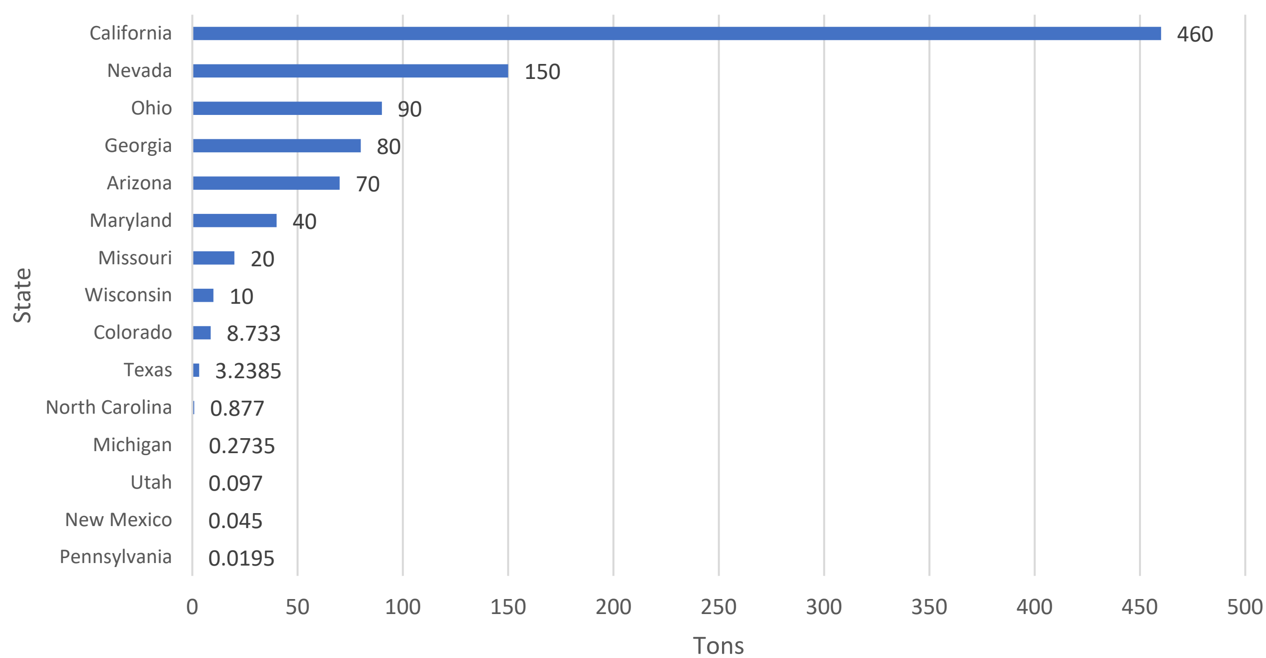

Figure 3.2-18: Destinations of Unspecified Universal Waste by State, Tons, 2021

Figure 3.2-19 shows the California counties that received unspecified universal waste in 2021. Of the 460 tons of unspecified universal waste shipped to destinations in California in 2021, San Bernardino County destinations received 280 tons (61%), Los Angeles County destinations received 130 tons (28%), and Orange County destinations received 50 tons (11%). Table 3.2-4 shows destinations of unspecified universal waste in tons by county in 2021.

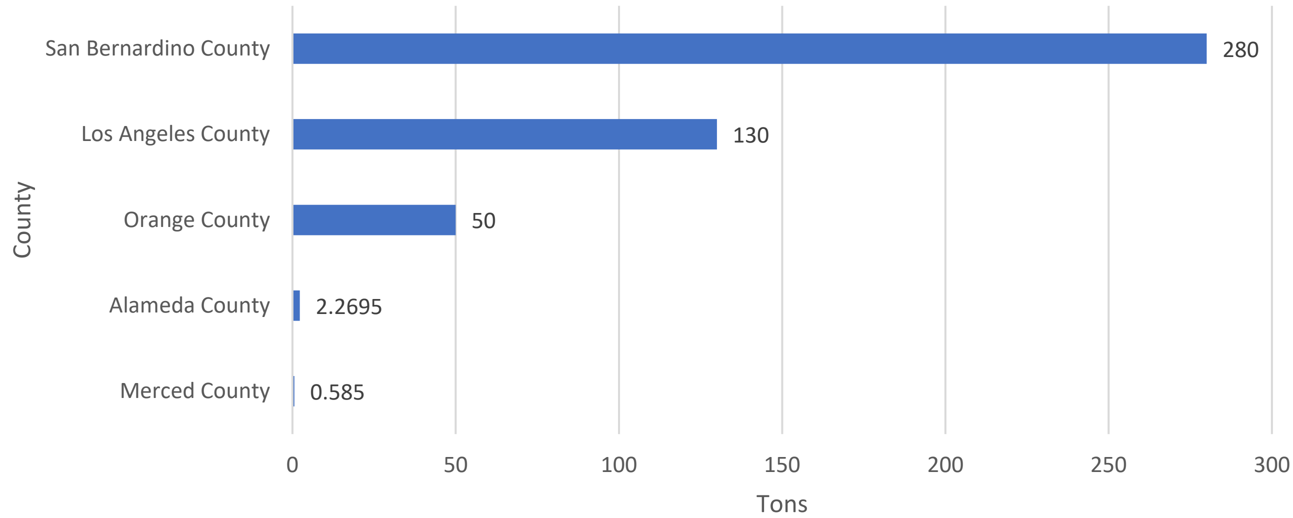

Figure 3.2-19: Destinations of Unspecified Universal Waste by County, Tons, 2021

3.2.7 Batteries

3.2.7.1 Treated Batteries

Universal waste handlers that handle batteries may conduct certain treatment activities as long as the casing of the battery cell is not breached and remains intact and closed. Authorized treatment activities include:[38] [39]

- Sort by battery type
- Mix battery types in one container
- Discharge batteries to remove the electric charge
- Regenerate used batteries
- Disassemble batteries and battery packs into individual batteries or cells
- Remove batteries from consumer products
- Remove electrolyte from batteries

A universal waste handler that removes electrolyte from batteries must determine whether the removed electrolyte is a hazardous waste and, if so, must manage the electrolyte as a hazardous waste. Similarly, a universal waste handler that removes batteries from consumer products must determine whether the remaining waste exhibits a characteristic of hazardous waste and manage it accordingly. Regenerated batteries are not considered a waste.

[38] Cells may be opened to remove electrolyte, but the cell must be closed immediately after removal of the electrolyte.
[39] Cal. Code Regs., tit. 22, § 66273.33(a)(2)

DTSC conducts an annual rechargeable battery survey to estimate the amount of batteries returned to handling or recycling facilities, but the survey does not request information from these facilities on the treatment of batteries. DTSC staff interviewed an employee with a company that engages in the recovery of valuable metals from end-of-life batteries and catalytic converters. The employee stated that the company breaks down batteries and treats electrolyte from batteries on site.

3.2.7.2 Destinations of Batteries

The DTSC rechargeable battery survey does not request information on the destinations of batteries collected by handlers and/or recyclers. DTSC staff interviewed an employee with a company that engages in the recovery of valuable metals from end-of-life batteries and catalytic converters. The employee stated that collected batteries may be shipped to different locations depending on the nature of the battery or associated material. Specifically, the employee conveyed the following information regarding that company's practices: Lithium primary batteries, which are single use and not rechargeable and, therefore, not part of the DTSC rechargeable battery survey, are shipped primarily to a destination in British Columbia, Canada; rechargeable Li-ion and Ni-Cd batteries are shipped to a destination in Ohio; lead-acid batteries are either shipped to a destination in California or exported; scrap metal fractions from batteries go to ferrous and non-ferrous metal facilities.

3.2.8 Lamps

3.2.8.1 Treated Lamps

Universal waste handlers are authorized to remove lamps from products or structures.[40] Universal waste lamps must be managed in a manner that prevents breakage to avoid potential release of toxic components.

3.2.8.2 Destinations of Lamps

Information about the destinations of lamps managed as universal waste is not available for this Report.

3.2.9 Mercury-Containing Equipment

3.2.9.1Treated Mercury-Containing Equipment

The treatment of mercury-containing equipment varies depending on the equipment being treated. Handlers are permitted to conduct the following activities:[41]

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[40] Cal. Code Regs., tit. 22, § 66273.33(b)(3)
[41] Cal. Code Regs., tit. 22, § 66273.33(c)

- Drain elemental mercury from pressure or vacuum gauges at the site where the gauges were generated.
- Remove mercury-containing batteries and switches from novelties.
- Remove mercury switches from motor vehicles and other products.
- Remove ampoules from thermostats.

Removed batteries, switches, ampoules, and drained mercury are universal wastes and must be managed appropriately. Novelties that were universal wastes due to the presence of mercury-containing switches or batteries are no longer hazardous waste once the battery or switch is removed, as long as the novelty doesn't otherwise exhibit a hazardous waste characteristic.

3.2.9.2 Destinations of Mercury-Containing Equipment

DTSC staff interviewed an employee from an industry-funded nonprofit corporation that transports and disposes of mercury switch thermostats. According to the employee, the mercury collected through the nonprofit corporation is retorted, or purified, at a destination in Wisconsin. The retorted mercury is sent to a precious metals supplier or prepared for long-term storage.

3.2.10 Non-Empty Aerosol Cans

3.2.10.1.1 Treated Non-Empty Aerosol Cans

Universal waste handlers can treat non-empty aerosol cans by processing the cans to remove and collect the contents.[42] The empty can is no longer a universal waste or a hazardous waste.

3.2.10.2 Destinations of Non-Empty Aerosol Cans

Information about the destinations of non-empty aerosol cans managed as universal waste is not currently available for this Report.

3.2.11 Photovoltaic (PV) Modules

3.2.11.1 Treated Photovoltaic Modules

Authorized treatment of photovoltaic (PV) modules (i.e., solar panels) is like authorized treatment of electronic devices. Universal waste handlers are authorized to remove from PV systems[43] discrete assemblies such as batteries, inverters, cables, connectors, or

[42] HSC § 25201.16(h)
[43] Cal. Code Regs., tit. 22, § 66273.71(c)

diode boxes, and are authorized to disassemble PV modules without the use of chemicals or external heat[44] and to physically treat and separate components.[45]

Facilities can report handling and treatment of PV modules to DTSC by either weight or count. Some facilities report handling PV modules by weight but report shipping modules by count. There is not a conversion from count to weight, because PV modules are made from a variety of materials and in a variety of sizes.

Handlers are required to report how the location that will receive the PV modules intends to manage them. The term “recycling” in this context can include activities like continued use, repair, redeployment, or reclamation activities. Additional information on the specific activities occurring at each facility is not available.

Figure 3.2-20 shows the fates of PV modules in 2021 by count. Of the 1,330 PV modules managed by a destination in 2021, about 1,090 modules (81%) were recycled, and about 250 modules (19%) were refurbished.[46] Table 3.2-6 shows fates of PV modules by count in 2021.

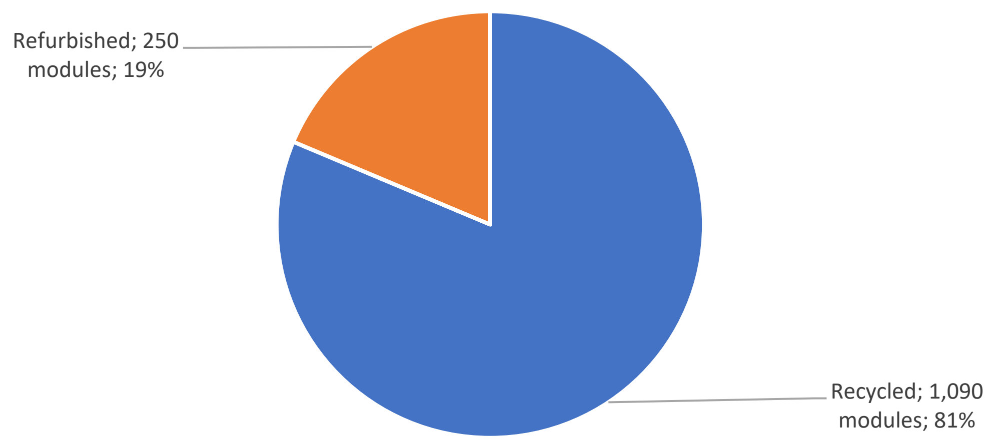

Figure 3.2-20: PV Modules Fates by Count, 2021

Figure 3.2-21 shows the fates of PV modules in 2021 by weight. Of the 660 tons of PV modules managed by a facility in 2021, about 540 tons (83%) were reported to be

[44] Cal. Code Regs., tit. 22, § 66273.72(f)
[45] Cal. Code Regs., tit. 22, § 66273.73(d)
[46] ” Recycled” is the term used by facilities that manage photovoltaic modules in annual reports for PV modules. The annual report does not require specific information and therefore specific management activities at these facilities was not available.

managed under the reuse/recover/recycle hierarchy.[47] The quantity of modules managed under each category in this hierarchy is not available. About 80 tons (12%) of PV modules were reported to be recycled[48] outside of the reuse/recover/recycle hierarchy, and about 30 tons (5%) were handled by a handler in California but not shipped to a destination. For quantities not shipped to a destination, there is no description of how they were managed. For quantities that were shipped to a destination, annual reports include a description of how the destination intended to manage the shipped modules. Table 3.2-5 shows fates of PV modules in tons in 2021.

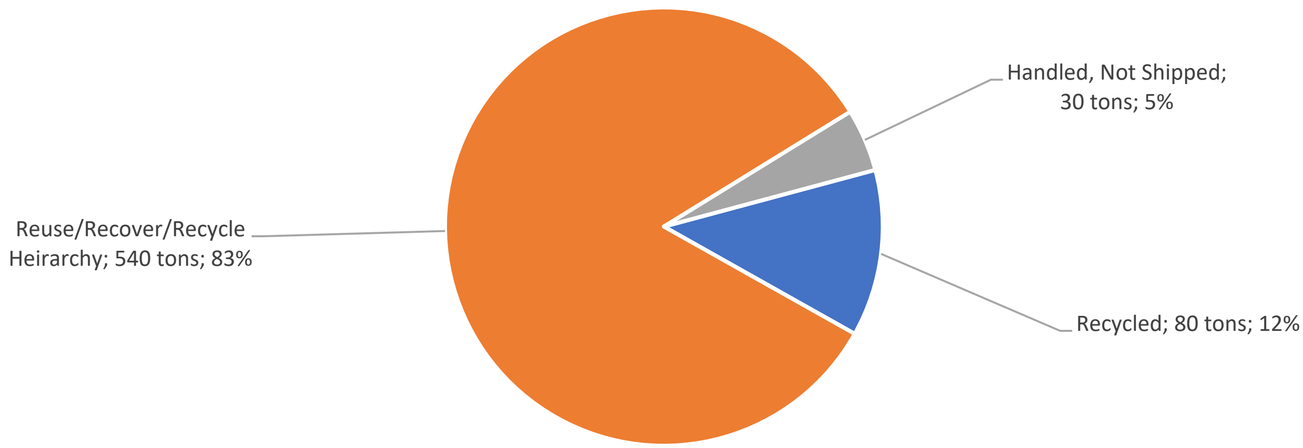

Figure 3.2-21: Fates of PV Modules in Tons, 2021

3.2.11.2 Destinations of Photovoltaic Modules

Figure 3.2-22 shows the states that received PV modules from California in 2021 by count. California handlers shipped about 1,330 PV modules to destinations in two states in 2021. About 1,000 modules (75%) went to destinations in Arizona, and about 340 (25%) were shipped to destinations in California. Table 3.2-3 shows count of destinations of PV modules by state in 2021.

[47] The terminology “reuse/recover/recycle hierarchy” is used here because the annual reports for PV modules use this terminology.

[48] ” Recycled” is the term used by facilities that manage photovoltaic modules in annual reports for PV modules. The annual report does not require specific information and therefore specific management activities at these facilities was not available.

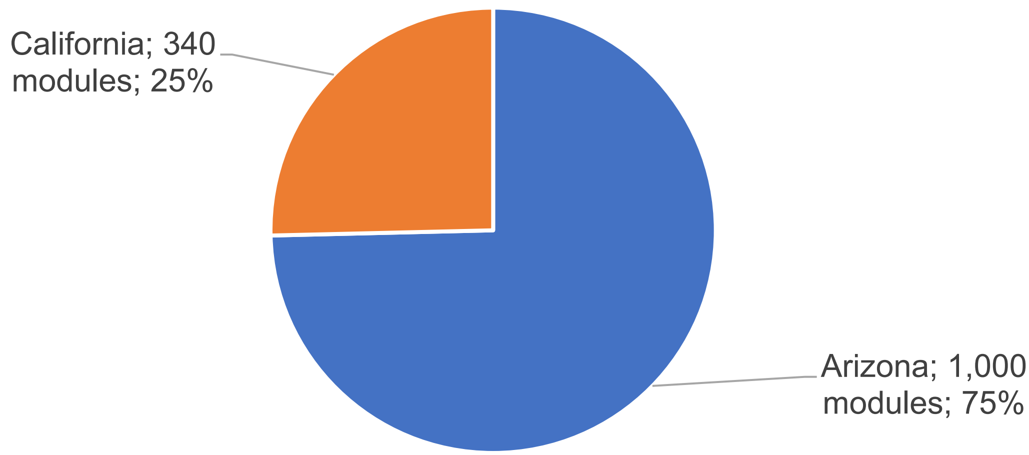

Figure 3.2-22: Count of PV Modules by Destination State, 2021

Figure 3.2-23 shows the states that received PV modules in 2021 by weight. Of the 630 tons of California PV modules shipped in the United States in 2021, about 600 tons (97%) were shipped to destinations in Texas, about 10 tons (2%) were shipped to Nevada, and about 10 tons (2%) went to Ohio. About 30 tons were handled by a handler in California but not shipped to a destination. Table 3.23 shows destinations of PV modules in tons by state in 2021.

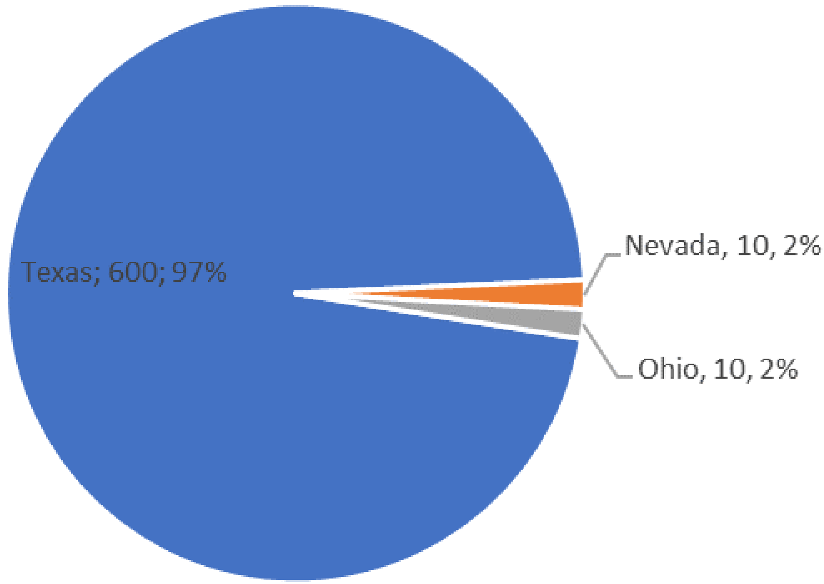

Figure 3.2-23: Destinations of PV Modules by State, Tons, 2021

Figure 3.2-24 shows the California counties that handlers shipped PV modules to in 2021 by count. California handlers shipped about 340 modules to destinations in two counties in 2021. About 250 modules (76%) went to San Bernardino County destinations, and about 80 tons (24%) were shipped to Sacramento County destinations. Table 3.2-4 shows the destination county of PV modules by count in 2021.

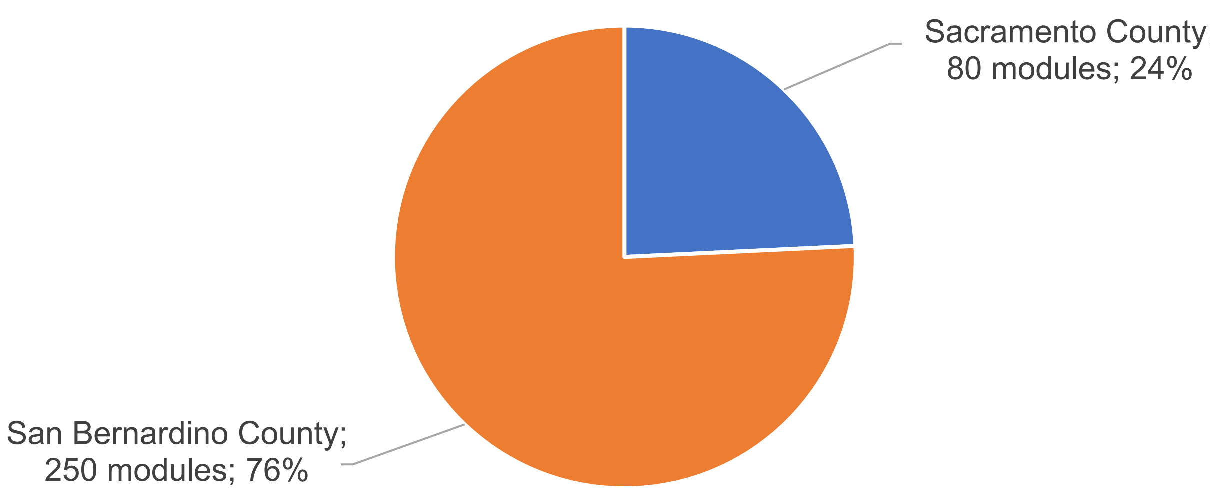

Figure 3.2-24: County Destinations of PV Modules by Count, 2021

Figure 3.2-25 shows the California counties where PV modules were handled in 2021 by weight. California handlers managed about 32 tons of PV modules in 2021. About 30 tons (94%) were handled by Fresno County handlers but not shipped to a destination, and nearly 2 tons of PV modules were handled by Stanislaus County handlers but not shipped to a destination. Table 3.24 shows destination counties of PV modules by tons in 2021.

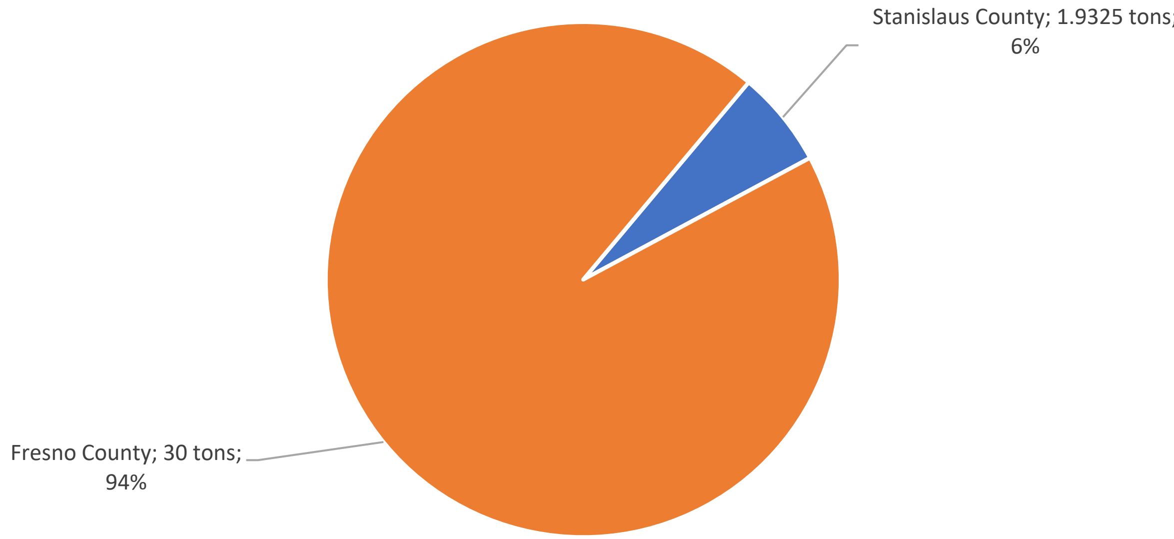

Figure 3.2-25: Destinations of PV Modules by Count, Tons, 2021

3.3 Household Hazardous Waste

3.3.1 Disposition of Household Hazardous Waste (HHW)

Certain hazardous wastes require specific methods of treatment and/or disposal. Treatment is any method, technique, or process that changes the physical, chemical, or biological character or composition of hazardous waste.[49] Disposal is discharge, deposit, injection or dumping into land or water.[50]

Figure 3.3-1 shows the disposition of California's household hazardous waste (HHW) in 2020-2021. About 63,800 tons of HHW was treated, recycled, or disposed of in the 2020-2021 reporting period. About 36,630 tons (57%) of HHW was recycled, about 12,370 tons (19%) was managed by PaintCare stewardship programs, about 6,680 tons

[49] Cal. Code Regs., tit. 22, §66260.10
[50] Cal. Code Regs., tit. 22, §66260.10

(11%) was destructively incinerated, and about 3,850 tons (6%) was incinerated for fuel use. Less than one ton of HHW was mercury that was managed through TRC stewardship programs (operated by Thermostat Recycling Corporation). Table 3.3-1 shows disposition of HHW in tons in 2020-2021.

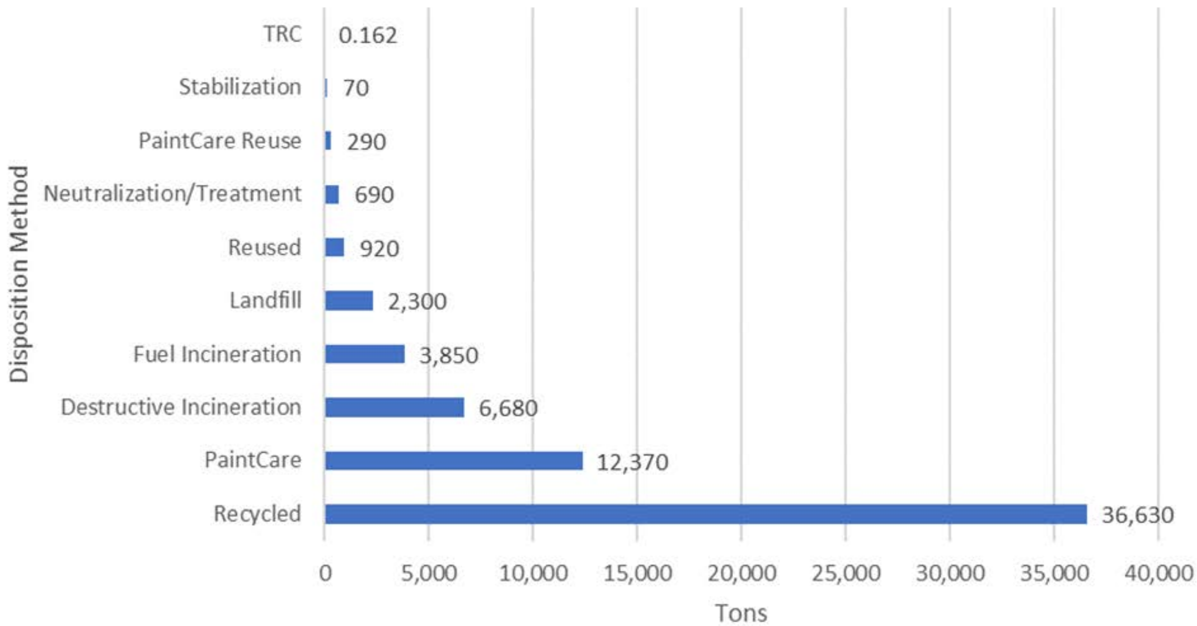

Figure 3.3-1: Disposition of HHW in 2020-2021, Tons

Figure 3.3-2 shows the counties where HHW was disposed of in the 2020-2021 reporting period. Of the 63,800 tons of HHW disposed of in the 2020-2021 reporting period, about 14,840 tons (23%) was disposed of in Los Angeles County, about 5,820 tons (9%) in Orange County, and about 3,230 tons (5%) in Alameda County. Table 3.3-2 shows disposition of HHW in tons by county in 2020-2021.

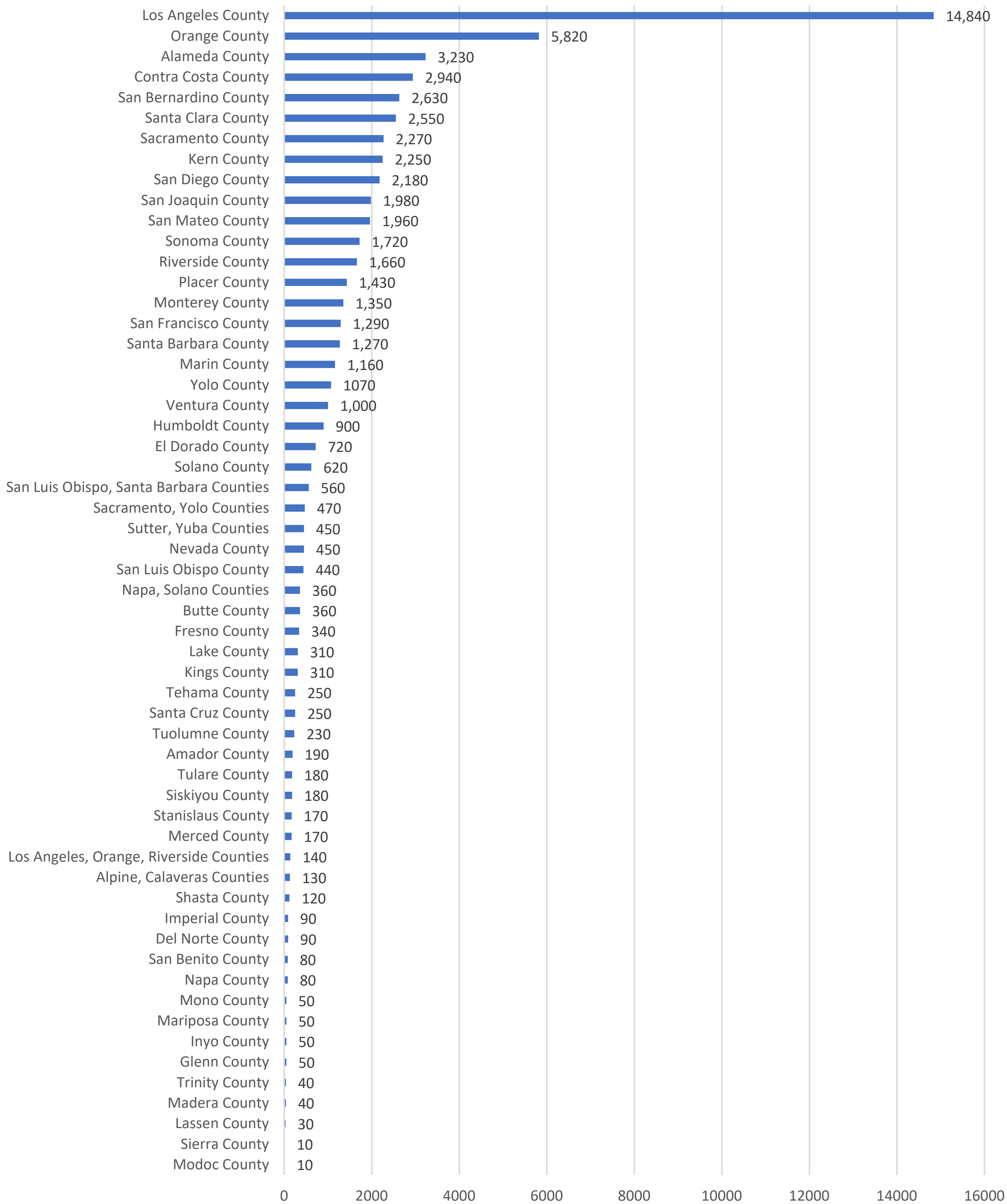

Figure 3.3-2: Disposition of HHW by County, Tons, 2020-2021

3.4 Treated Wood Waste

Non-RCRA hazardous treated wood waste is subject to alternative management standards. These include lessened storage requirements extended accumulation periods, shipments are allowed without a hazardous waste manifest or hazardous waste transporter and allow disposal at specific non-hazardous waste landfills. These standards promote the safe and economical disposal of treated wood waste.

This principle was illustrated in 2021, after these alternative management standards were briefly abolished due to the veto of Senate Bill 68. This lapse in standards created issues for generators, homeowners, landfills, and DTSC. Generators of treated wood waste needed to either arrange for Class I disposal or find alternatives, likely increasing costs for generators. In addition, DTSC granted variances during the lapse to allow generators of treated wood waste to dispose of it in certain landfills. Generators needed to apply for and pay for these variances, and issuance of these variances took weeks of processing time. DTSC also received calls from generators and homeowners asking where to take treated wood waste. The lapse in alternative management standards created concerns because landfills no longer accepted treated wood waste, and there were reports of illegal disposal of treated wood waste. Assembly Bill 332 restored the alternative management standards on August 31, 2021, allowing the disposal of treated wood waste to non-hazardous landfills. In the bill, the legislature stated its intent to "continue to evaluate the alternative management standards for treated wood waste, including the potential for longer term solutions that may replace the continuation of the alternative management standards and disposal of treated wood waste in solid waste landfills."

Treated wood waste facilities and landfills that accept treated wood waste submit semiannual reports to DTSC using the Treated Wood Waste Tracking System. DTSC's website includes lists of State Water Resources Control Board-approved treated wood waste landfills, transfer facilities that accept treated wood waste, and transporters that deliver treated wood waste to disposal facilities.[51]

Detailed information regarding the destination of all treated wood waste is not available for this Report. However, destination information for treated wood waste that is tracked with a manifest is found in HWTS using State Waste Code 614.

[51] "DTSC Requirements for Generators of Treated Wood Waste (TWW) Fact Sheet." *Dtsc.ca.gov*, State of California, Sept. 2021, Website Link.

3.5 Used Oil Filters

3.5.1 Discussion

Used oil filter regulations allow generators to pierce and crush drained used oil filters. This treatment does not require a hazardous waste treatment permit.[52]

An estimate of the quantity of used oil filters treated, recycled, or disposed of annually is not available. However, some of this information is captured through CalRecycle's Form 303 data under the "Reclaimables" category. Disposition data for recycled materials recorded through Form 303 data is in section 3.3.1, Disposition of Household Hazardous Waste.

3.6 Discussion

Approximately 21 million tons of manifested hazardous waste was generated in California from January 2010 to May 2022. Just over 17 million tons (81%) of that was non-RCRA hazardous waste, while about 3.8 million tons (19%) was RCRA hazardous waste. Just over half of the manifested hazardous waste generated since 2010, 11 million tons (53%), was managed within California, with the remainder shipped outside California for management.

Land disposal has been the most common method of managing hazardous waste generated in California since 2010, with approximately 12.5 million tons (59.2%) disposed of in a land disposal unit. The second most common method is "other recovery or reclamation for reuse," accounting for 5.09 million tons (24.2%) of waste. Incineration is the third most common method, with approximately 620,000 tons (2.31%) of hazardous waste managed since 2010. Access to incinerator capacity is a significant challenge for the current hazardous waste management system.

3.6.1 Access to Capacity

Access to appropriate disposal facilities that are carefully constructed and managed in a way that protects human health and the environment is one of the most crucial components of the hazardous waste management system. The lack of capacity can lead to improper or illegal disposal. Access to all types of hazardous waste management facilities is important, including the least-preferred management method, land disposal.

To be accessible, facilities must have enough capacity. Measuring the capacity of California's hazardous waste management facilities requires an estimate of the remaining volume of landfills and an estimate of the amount of waste that can safely pass through treatment or recycling facilities (throughput).

[52] Cal. Code Regs., tit. 22, § 66266.130(d)

3.6.1.1 Land Disposal Capacity

As of 2019, the two hazardous waste landfills currently in operation in California had a combined remaining capacity of 9,741,100 tons.[53] At the current rate of disposal – with 48 percent of land-disposed hazardous waste being disposed of in state – these two landfills had about 20 years of permitted capacity remaining. If 100 percent of California's land-disposed hazardous were disposed of in state, they would have 9.5 years of permitted capacity remaining.

This Report found that almost 88 percent (11 million tons) of California's land-disposed hazardous waste manifested since 2010 has been non-RCRA waste. About 42 percent of this non-RCRA waste (4,640,000 tons) has been land disposed at non-hazardous Subtitle D landfills outside of California. This represents a significant quantity of hazardous waste that could potentially be disposed of in state if California had more capacity and/or if existing capacity were more accessible.

California's limited landfill capacity can be affected by a number of factors, including, but not limited to:

- Physical considerations: Facilities may be non-operational for a period of time while undergoing maintenance, may not be equipped to adequately treat difficult waste types, or may not be designed to maximize the amount of waste they are allowed to manage annually.
- Choice: Facility operators are under no obligation to accept every waste presented to them.
- Economic considerations: At the same time that California has a limited supply and a high demand for hazardous waste landfill capacity, a much greater and accessible supply exists in other states that allow non-RCRA waste to be managed in non-hazardous waste landfills. This also lowers the cost of disposal out of state because non-hazardous waste landfills are less expensive to build and operate. Generators send that non-RCRA waste out of state realize a cost savings in disposal.

The HWPlan unit will conduct additional research to better understand access to hazardous waste management capacity in California. Research will be informed by waste generation information and consideration of specific waste streams.

[53] U.S. EPA. National Capacity Assessment Report. December 2019.

3.6.1.2 Throughput Capacity

Another way to assess the capacity of hazardous waste management facilities is to measure throughput capacity – the amount of waste that can flow through a system over a certain time period. In this case, this measure applies to systems that conduct management activities like recycling and treatment of hazardous waste. Throughput is vital to appropriately managing current and future waste streams because it can be a significant limitation as exemplified by recent incinerator issues.

Throughput capacity has become especially important for recycling some growing waste streams in California like photovoltaics (PVs) and lithium-ion batteries. This is vital because these hazardous items can only be recycled if there is available technology to recycle these wastes as well as capacity. An adequate throughput capacity is essentialto safe hazardous waste management and the ability for the state to support a more circular economy.

The HWPlan unit will conduct additional research in this area to better understand access to hazardous waste throughput capacity in California. Research will be informed by waste generation information and consideration of growing waste streams.

Department of Toxic Substances Control

CalEPA
California Environmental Protection Agency

Draft Hazardous Waste Management Report

Implementation of California Health and Safety Code Section 25135

Section 4

4. Analysis of Hazardous Waste Facilities and Surrounding Areas

Health and Safety Code § 25135(b)(2)(A) requires an analysis of hazardous waste facilities that operate in California, whether they operate under a DTSC permit or are authorized to manage hazardous waste without a permit.

The analysis for this section includes information from the 2021 operations of California's permitted hazardous waste facilities, universal waste handlers, universal waste recyclers, and universal waste destinations.

The number of facilities that handle universal waste is more likely to vary from year to year than permitted facilities, which hold permits that are effective for 10 years.[1]

4.1 Analysis of Hazardous Waste Facilities

Any person who treats, stores, or disposes of hazardous waste must obtain a permit or authorization from DTSC.[2] California has a five-tier permitting program:

- Full Permit tier
- Standardized Permit tier[3]
- Permit by Rule (PBR) tier[4]
- Conditional Authorization tier[5]
- Conditional Exemption tier,[6] which includes four subcategories:
    - Conditionally Exempt Small Quantity Treatment (CESQT)[7]
    - Conditionally Exempt Specified Wastestream (CESW)[8]
    - Conditionally Exempt – Limited (CEL)[9]
    - Conditionally Exempt Commercial Laundries (CECL)[10]

DTSC oversees facilities operating under Full Permits and Standardized Permits. The Full Permit tier includes all facilities that require a RCRA equivalent permit and facilities

[1] A permit may be continued for longer than 10 years if a facility meets the regulatory requirements established in Cal. Code Regs., tit. 22, § 66270.51. The conditions of a continued permit are fully effective and enforceable until a new permit decision is issued.
[2] HSC § 25200
[3] HSC § 25201.6
[4] Cal. Code Regs., tit. 22, § 67450.1 through § 67450.13
[5] HSC § 25200.3
[6] HSC § 25201.5
[7] HSC § 25201.5(a)
[8] HSC § 25201.5(c)
[9] HSC § 25201.14
[10] HSC § 25144.6(c)

that conduct certain non-RCRA activities.[11] The Standardized Permit tier includes facilities that require a non-RCRA permit but not a RCRA permit.

The PBR tier, Conditional Authorization tier, and Conditional Exemption tier allow for on-site treatment of hazardous wastes that are classified as non-RCRA or RCRA-exempt and only if those wastes are generated on site and treated on site. Only hazardous wastes generated on site may be treated on site. Facilities that treat hazardous waste under these tiers are required to notify their local Certified Unified Program Agency (CUPA). CUPAs are local agencies certified by CalEPA to implement and enforce six state hazardous waste and hazardous materials regulatory management programs.[12]

The programs that the CUPAs implement are:

- Aboveground Petroleum Storage Act (APSA) Program
- California Accidental Release Prevention (CalARP) Program
- Hazardous Materials Business Plan (HMBP) Program
- Hazardous Material Management Plan (HMMP) and Hazardous Material Inventory Statements (HMIS) (California Fire Code)
- Hazardous Waste Generator and Onsite Hazardous Waste Treatment (tiered permitting) Programs
- Underground Storage Tank Program

At the time of this analysis, there were 74 facilities[13] with either a full or standardized operating permit in California. Table 4.2-3 includes information about these 74 TSDFs. 47 of these facilities are labeled in Envirostor as having a RCRA permit, 24 having a Standardized permit, and three facilities having a state-only permit.[14]

Universal waste is managed differently than other hazardous wastes in California. Handlers of any amount of universal waste are required to obtain an EPA ID number from DTSC.[15] California issues federal EPA ID numbers to handlers that accumulate

[11] "DTSC Fixed Treatment Unit Operating Under Conditional Authorization Fact Sheet." *Dtsc.ca.gov*, State of California, May 2005, Website Link.
[12] "What Is a CUPA?" *What Is a CUPA?*, California CUPA Forum, Website Link.
[13] One permitted hazardous waste facility closed during research; analysis was completed with 74 facilities.
[14] State-only permits are considered equivalent to full RCRA permits but are labeled differently in EnviroStor.
[15] "Hazardous Waste Identification (ID) Numbers." *Dtsc.ca.gov*, State of California, Website Link.

5,000 kg or more of universal waste.[16] Some handlers may also be required to submit a notice of intent (NOI) with DTSC to collect certain types of hazardous waste, such as e-waste. Table 4.1-1 lists universal waste handlers, and Table 4.1-2 shows universal waste handlers that were also listed as destinations in 2021.

Generators that generate 100 kg or less of RCRA hazardous waste that is hazardous only due to silver do not need an EPA ID number[20] from DTSC.

4.2 Analysis of Destination Facilities

HSC § 25135(b)(2)(B) requires "an analysis of the location of each destination facility." The term "destination facility" is used more broadly in HSC § 25135 than elsewhere in the Health and Safety Code and California Code of Regulations[21] to refer to any facility that receives a shipment of any hazardous waste generated in California, including out-of-state locations and transfer facilities.

This distinction is important because HSC § 25135 extends the evaluation to more facilities than just universal waste facilities. Further, because of the broad use of the term, the evaluation extends to more facilities than just TSDFs. Many out-of-state facilities that manage California's non-RCRA hazardous waste are not permitted hazardous waste facilities because most states would not identify non-RCRA hazardous waste as hazardous waste in their state. Therefore, non-RCRA hazardous waste may be shipped to other states to be managed in non-hazardous waste facilities.[22]

This analysis did not include disposal facilities that received hazardous wastes that have alternative management standards or other management exemptions, such as treated wood waste. Information for these facilities was not available in time to be included in this report. However, future research can include these facilities.

DTSC used four primary data sources to obtain destination facility information: the Hazardous Waste Tracking System (HWTS), EnviroStor, Universal Waste Electronic Devices online system (UWED), and the DTSC photovoltaic (PV) module annual report for 2021. The UWED online system included some facilities that were permanently closed, some that did not have additional information available via online search engines, and some that either had a different business at the listed address or appeared to be listed under residential addresses or corporate offices. In addition, some

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[16] Cal. Code Regs., tit. 22, § 66273.32(a)
[20] "Hazardous Waste Identification (ID) Numbers." *Dtsc.ca.gov*, State of California, Website Link.
[21] HSC § 25201.16, Cal. Code Regs., tit.22, § 66260.10, and Cal. Code Regs., tit.22, § 66273.9
[22] Subtitle D landfills focus on management of non-hazardous solid waste such as household garbage and non-hazardous industrial solid waste.

businesses had errors in business names or addresses. DTSC attempted to fix errors, but some errors may persist.

To analyze the areas surrounding destination facilities and TSDFs, DTSC examined zoning, CalEnviroScreen scores, CalEnviroScreen percentiles, EJScreen scores, and geographic analyses. This report summarizes this information in tables as described in the sections below.

4.2.1 Zoning

California Government Code, Title 7, § 65300.9 requires city and county planning agencies to prepare a "comprehensive, long-term general plan for the physical development of the county or city"[23] and requires zoning and associated ordinances to be consistent with the general plan.[24] Each general plan must include the following elements:[25]

- Land use
- Circulation
- Housing
- Conservation
- Open space
- Noise considerations
- Safety
- Environmental justice

4.2.1.1 Data Sources and Limitations of Zoning

To gather zoning information, DTSC accessed the map or diagram of a city or county's zones as determined by the general plan. Many zoning maps are interactive, allowing the user to type in an address and retrieve information about that address, including zoning. Other maps are available as PDF documents that can be aligned with mapping software to find correct address and zoning information. DTSC project managers provided zoning information for some permitted facilities.

Zoning is not permanent and may change over time to meet the needs of the general plan. Since zoning and its associated ordinances are decided at the county or city level, it is important to note that zoning definitions may vary between general plans.

[23] Cal. Gov. Code, tit. 7, § 65300.9
[24] Cal. Gov. Code, tit. 7, § 65860
[25] Cal. Gov. Code, tit. 7, § 65302

Some data sources, such as UWED, had errors in addresses. DTSC attempted to fix these errors, but some errors may persist.

Some areas may have limited zoning information. Some military bases for example had no zoning information.

Zoning information for facilities is presented in table format, separated by facility type. Table 4.2-1 shows the zoning designation for each California universal waste destination and for the top 31 out-of-state universal waste destinations. Table 4.2-2 shows the zoning designation for each universal waste recycler. Table 4.2-3 shows the zoning designation for each permitted facility. Table 4.2-4 shows the zoning designation for the 31 out-of-state facilities that received the most manifested waste.

4.2.2 CalEnviroScreen Score

CalEnviroScreen is an environmental justice (EJ) mapping tool developed by the California Office of Environmental Health Hazard Assessment (OEHHA) "to help identify California communities that are disproportionately burdened by multiple sources of pollution." This report uses the most recent version of the tool, CalEnviroScreen 4.0.

CalEnviroScreen creates a score for each census tract in California based on available environmental, health, and socioeconomic information. Communities most burdened by pollution and other environmental hazards have the highest scores.[26]

A CalEnviroScreen score represents the percentile ranking among all of the state's 8,000 census tracts. For example, a tract with a percentile of 85 has a higher CalEnviroScreen score than 85 percent of all census tracts in the state. However, CalEnviroScreen scores are not available for some census tracts that have unreliable data due to low population or other reasons.

Figure 4.2-1 shows a map of California with the CalEnviroScreen percentile scores for each census tract. Scores are presented in a range of green to red – green indicating census tracts with lower scores and red indicating those with higher scores. Gray census tracts are those that do not have a score because of high pollution paired with low population. In general, census tracts in the Central Valley and in much of inland Southern California tend to have higher CalEnviroScreen scores than coastal and mountainous census tracts.

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[26] August, Laura, et al. Edited by Vince Cogliano et al., Office of Environmental Health Hazard Assessment, 2021, *CalEnviroScreen 4.0*, Website Link. Accessed 6 Sept. 2022.

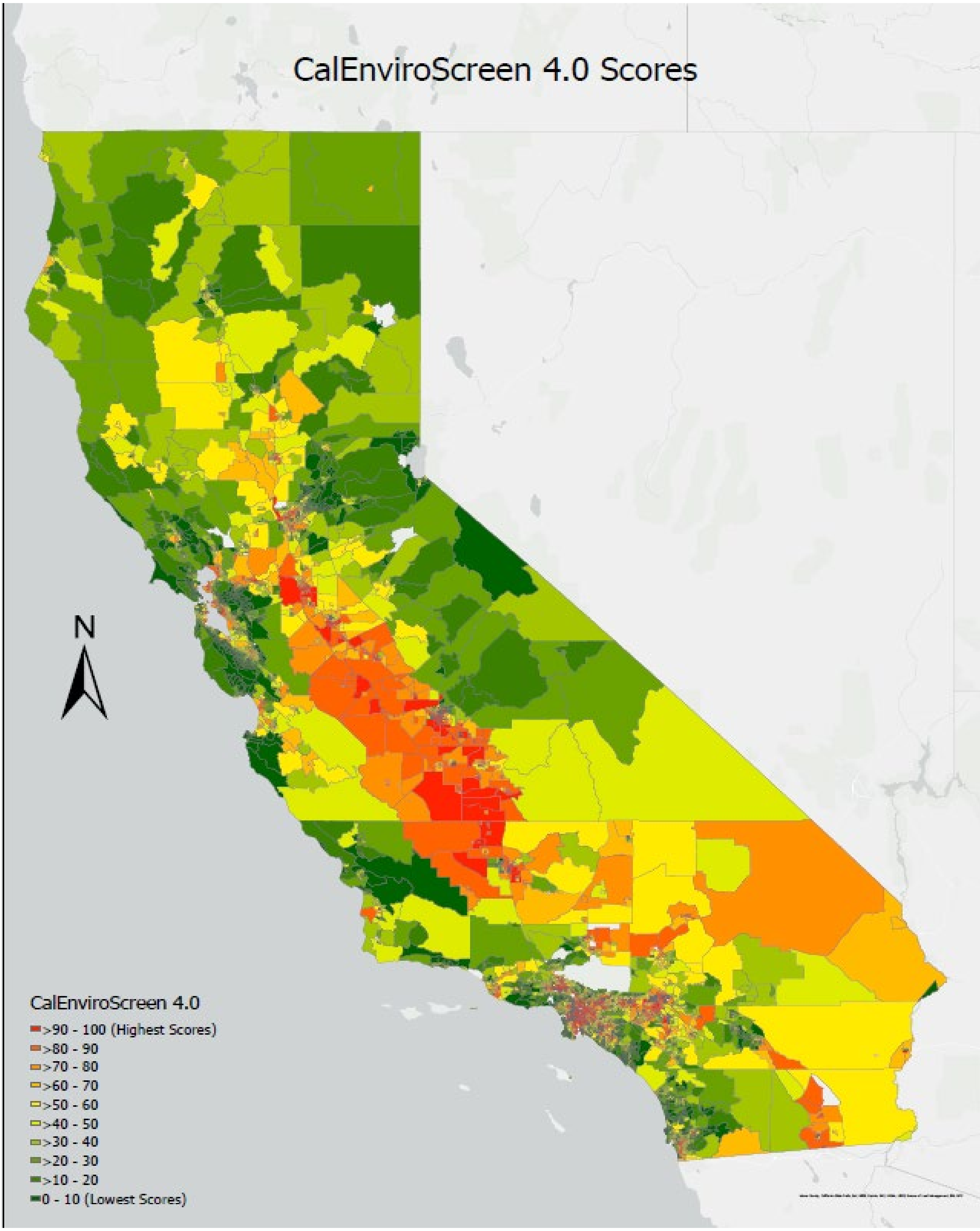

Figure 4.2-1: A Map of California with CalEnviroScreen 4.0 Scores

4.2.2.1 CalEnviroScreen Analysis

CalEnviroScreen scores and percentiles only apply to California facilities. DTSC used CalEnviroScreen 4.0 for this assessment.

While 141 facilities received universal waste in California in 2021, this assessment includes 137 of these facilities. Four facilities were omitted because they were located in census tracts with unreliable or unavailable CalEnviroScreen data. Of the 137 facilities in this assessment, 67 (49%) were at or above the CalEnviroScreen 75th percentile.

While 56 facilities identified themselves as recyclers in UWED in 2021, this assessment included 52 of these facilities. Four facilities were omitted because they were located in census tracts with unreliable or unavailable CalEnviroScreen data. Of the 52 assessed facilities, 24 (46%) were in census tracts at or above the CalEnviroScreen 75th percentile.

While there were 74 permitted facilities in California in 2022, this assessment included 64 of these facilities. Ten facilities were omitted because they were located in census tracts with unreliable or unavailable CalEnviroScreen data. Of the 64 facilities assessed, 30 (47%) were in census tracts at or above the CalEnviroScreen 75th percentile.

The CalEnviroScreen scores and percentiles for each California facility are available in table format. Table 4.2-1 shows the CalEnviroScreen score and percentile for each universal waste destination. Table 4.2-2 shows the CalEnviroScreen score and percentile for each universal waste recycler. Table 4.2-3 shows the CalEnviroScreen score and percentile for each permitted facility. Because CalEnviroScreen scores are only available for California facilities, out-of-state facilities do not have CalEnviroScreen data.

4.2.3 EJScreen Score

U.S. EPA's EJScreen is an environmental justice mapping and screening tool that evaluates geographic areas throughout the United States.

EJScreen includes 12 indexes that combine environmental and socioeconomic information. For the purposes of this report, DTSC used the "Hazardous Waste Proximity" index and the "Compare to US" option. The score included in tables is the "EJ Index Hazardous Waste" percentile.

Table 4.2-1 shows the EJScreen score for each universal waste destination in the United States. Table 4.2-2 shows the EJScreen score for each universal waste recycler from UWED. Table 4.2-3 shows the EJScreen score for each permitted facility in

California. Table 4.2-4 shows the EJScreen score for the 31 out-of-state facilities that received the most manifested hazardous waste from California.

4.2.3.1 EJScreen Score Limitations

While the EJScreen tool is useful for comparing destinations across the United States, it is important to note that it has some limitations. U.S. EPA's EJScreen technical documentation discusses two main limitations: 1) EJScreen is not a detailed risk analysis, and 2) there is uncertainty in the data used.

EJScreen does not capture every relevant issue involved in environmental justice, and nationwide databases may not exist for all these issues. EJScreen's demographic estimates come from survey data rather than more reliable census data, and its environmental indicators are only screening-level representations of actual health risks or exposures.

Because of the limitations involved in EJScreen, U.S. EPA recommends using its data in conjunction with local information, if applicable, and advises against solely using screening data for key decisions.[27]

4.2.3.2 EJScreen Analysis

Data in EJScreen is presented as a percentile, which is a relative term, as opposed to a percentage, which is an absolute term. A national percentile represents what percent of U.S. census tracts have an equal or lower value. If a census tract is at the 87th percentile, 87 percent of U.S. census tracts have a value equal to or lower than that tract.

As mentioned previously, DTSC completed this assessment using EJScreen's "Hazardous Waste Proximity" index. This index is a count of TSDFs and large quantity generators (LQGs). EJScreen retrieved the TSDF data for this index in April 2022 from the EPA RCRAInfo database, but it is not immediately clear where EJScreen obtained its LQG data or when.[28]

While 141 destination facilities received universal waste in California in 2021, 140 were used in this assessment. One facility was omitted because its physical address could not be located. Of these 140 facilities, 115 (82%) were in census tracts with EJScreen scores at or above the 75th percentile.

[27] U.S. Environmental Protection Agency (EPA), 2019. EJSCREEN Technical Documentation.
[28] "Overview of Environmental Indicators in EJScreen." *EPA*, Environmental Protection Agency, 11 Oct. 2022, Website Link.

In 2021, 100 out-of-state destination facilities received universal waste from California. Thirty-five of these facilities (35%) were in census tracts with EJScreen scores at or above the 75th percentile.

There were 56 facilities that identified themselves as recyclers in UWED in 2021. Of the 56 facilities in this assessment, 43 (77%) were in census tracts with EJScreen scores at or above the 75th percentile.

There were 74 permitted facilities in California used in this assessment. Of these, 49 (66%) were in census tracts with EJScreen scores at or above the 75th percentile.

More than 95 percent of the manifested waste that was shipped out-of-state in 2021 was managed at 31 facilities. Of these 31 out-of-state facilities, four (13%) were in census tracts with EJScreen scores at or above the 75th percentile.

4.2.4 Geographic Analysis

HSC § 25135(b)(2)(B) states, "For destination facilities located in the state, this analysis shall include zoning and other geographic information." The specific categories of geographic information required in the statute are not specified. Therefore, DTSC analyzed two areas of interest relating to geographic analysis for this initial report:

- Identification of facilities within one mile of a sensitive receptor, as defined by the U.S. EPA.
- Identification of facilities within the boundary of areas designated as SB 535 disadvantaged communities (DAC) in accordance with Senate Bill (SB) 535.

The U.S. EPA definition of sensitive receptors includes, but is not limited to: hospitals, schools, day care facilities, elderly housing, and convalescent facilities. These are areas where the occupants may be more susceptible to the potentially adverse effects of exposure to toxic chemicals, pesticides, and other pollutants.[29]

SB 535 required CalEPA to identify disadvantaged communities. CalEPA identifies four types of geographic areas as disadvantaged:

- 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.

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[29] "What Are Sensitive Receptors?" *U.S. EPA*, United States Environmental Protection Agency, 29 Mar. 2022, [Website Link].

- Census tracts identified in the 2017 DAC designation as disadvantaged, regardless of their scores in CalEnviroScreen 4.0.
- Lands under the control of federally recognized Tribes.

4.2.4.1 Data Sources and Limitations of Geographic Analysis

DTSC completed geographic analysis by examining a one mile radius around each destination facility. The facility address was entered into a geographic information system (GIS) map application, ArcGIS, which included layers showing SB 535 disadvantaged communities and sensitive receptors. DTSC chose a one mile radius to establish a baseline for this analysis.[30] Because the ArcGIS software measures the one mile radius from the approximate center of an address and not from the edge of the facility, this methodology may not show all sensitive receptors within one mile of a facility's edge.

If a destination facility was in an SB 535 disadvantaged community, it is marked with a "Y" for "Yes" in Tables 4.2-1, 4.2-2, 4.2-3, and 4.2-4. A destination facility is also marked with a "Y" in these tables if there was a sensitive receptor within one mile of it. DTSC divided the number of "Yes" entries by the total number of facilities and multiplied by 100 to get the percent of facilities that fit a particular category.

The layers used in the ArcGIS application include:

- Private Schools by HostedByHIFLD
- Public School Locations – Current by National Center for Education Statistics
- Hospitals in California by crcdata@ou.ad3.ucdavis.edu_ucdavis
- Nursing Homes by HostedByHIFLD
- SB 535 Disadvantaged Communities 2022 by oehha_arcgis
- Child Care Centers by HostedByHIFLD

ArcGIS may be limited by the layers and data available. For example, if a layer for hospitals is available but has not been updated recently, the information presented on the layer may be outdated. Alternatively, a layer may not exist and would need to be created, which requires time, effort, and funding. Information used in analysis should only come from trustworthy sources. A lack of information from such sources may limit what can be analyzed. Occasionally, hospitals and schools on military bases did not appear in the hospital and school layers. In this case, satellite imagery was helpful in

[30] Prior work conducted for the SB 673 project was considered for use in part of this analysis. The work performed for SB 673 was only related to permitted facilities so it would have been incomplete since this exercise was to review all types of hazardous waste destination facilities. Further, it was unclear how recent the data for sensitive receptors was or if it would accurately capture any impacts caused by closures of sensitive receptors due to COVID. Lastly, it was unclear if the methodology could be recreated within this reporting period for all other hazardous waste destination facilities.

determining whether a destination facility on a military base was within a one mile radius of a sensitive receptor.

Additional limitations in geographic analysis result from incorrectly entered addresses. If an address is not correct in a data set, such as numbers being in an incorrect order, the analysis may reflect an incorrect location. A similar limitation exists if a corporate office is listed in a database as the destination instead of the actual facility that received hazardous waste, including universal waste. While we have made efforts to correct these errors from their respective sources, some errors may persist.

Some addresses were not correctly mapped in the ArcGIS application even though the address was correct. In these cases, the ArcGIS application was used in conjunction with satellite imagery to double-check whether the address was correctly mapped in ArcGIS.

DTSC did not perform geographic analysis for destinations outside the United States. For future reports, it is recommended to determine the feasibility of evaluating destinations outside the U.S. in a manner that is similar to the analysis performed for U.S. facilities. Some limitations to consider include language barriers, differences in zoning, and the availability of assessment tools. In 2021, 19 universal waste destinations were located outside of the United States.

4.2.4.2 Results of Geographic Analysis

4.2.4.2.1 Sensitive Receptors

241 destination facilities in the U.S. received universal waste from California in 2021, 141 of which were in California. One of those California facilities was omitted from this assessment because its physical address could not be located. Ninety percent of the 240 facilities assessed (217) were within one mile of a sensitive receptor. Of the 140 California facilities assessed, 94 percent (132 facilities) were within one mile of a sensitive receptor. Of the 100 out-of-state facilities assessed, 85 percent (85 facilities) were within one mile of a sensitive receptor.

All of the 56 recyclers that reported treating California's universal waste in UWED in 2021 were in California, and 47 of those facilities (84%) were within one mile of a sensitive receptor.

Of the 74 California permitted facilities operating in 2021, 73 percent (54 facilities) were within one mile of a sensitive receptor. Of the 47 facilities with a RCRA permit, 32 facilities (68%) were within one mile of a sensitive receptor. Of the 24 facilities with a standardized permit, 20 facilities (83%) were within one mile of a sensitive receptor. Of the three facilities with a state-only permit, two (66%) were within one mile of sensitive receptor.

More than 95 percent of the manifested waste that was shipped out of California in 2021 went to 31 facilities. Eight of these 31 out-of-state facilities (26%) were within one mile of a sensitive receptor.

DTSC presents this sensitive receptor information for these destination facilities in table format. As previously mentioned, the U.S. EPA definition of sensitive receptors includes, but is not limited to: hospitals, schools, day care facilities, elderly housing, and convalescent facilities. Table 4.2-1 shows sensitive receptor information for each California universal waste destination. Table 4.2-2 shows the information for each universal waste recycler. Table 4.2-3 shows the information for each permitted facility. Table 4.2-4 shows the sensitive receptor information for the 31 out-of-state facilities that received the majority of manifested waste from California.

4.2.4.2.2 Disadvantaged Communities

Purant to SB 535, CalEPA idetifies four types of geographic areas as SB 535 disadvantaged communities:

- 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 DAC designation as disadvantaged, regardless of their scores in CalEnviroScreen 4.0.
- Lands under the control of federally recognized Tribes.

SB 535 and its definitions only apply to California facilities and not to facilities in other states.

While there were 141 destination facilities that received universal waste in California, 140 were used in this assessment. One facility was omitted because its physical address could not be located. Of the 140 facilities used in this assessment, 83 facilities (59%) were within SB 535 disadvantaged communities.

Of recyclers that reported treating universal waste in UWED, 31 facilities out of a total of 56 (55%) were within an SB 535 disadvantaged community.

Of permitted facilities in California, 41 facilities out of a total of 74 (55%) were within disadvantaged communities. Of the 47 facilities with a RCRA permit, 27 (57%) were within disadvantaged communities. Of the 24 facilities with a standardized permit, 11 (46%) were within disadvantaged communities. The three facilities with state-only permits were within disadvantaged communities.

SB 535 information for each facility is available in table format. Table 4.2-1 includes the SB 535 information for each universal waste destination. Table 4.2-2 includes the SB 535 information for each universal waste recycler. Table 4.2-3 includes the SB 535 information for each permitted facility.

4.3 Summary

Information in this section included an analysis of hazardous waste facilities that operate in California and a description of each destination facility. The analysis for this section included information from the 2021 operations of California's permitted hazardous waste facilities, universal waste handlers, universal waste recyclers, and universal waste destinations.

The term "destination facility" in HSC § 25135 is used more broadly to refer to any facility that received a shipment of hazardous waste generated in California, including out-of-state locations and transfer facilities. Information was not available in time for this analysis regarding disposal facilities that received hazardous wastes with alternative management standards or other management exemptions, such as treated wood waste. However, future research will include these facilities.

Zoning is determined at the local level of government. State codes mainly provide a framework for cities and counties to follow when planning and determining zones and ordinances. City and county planning agencies are responsible for preparing a long-term general plan and determining zoning and ordinances to meet that plan. Zoning is not permanent and can be changed to meet the needs of a city's or county's general plan.

The assessment of the areas surrounding destination facilities included the use of ArcGIS and satellite imagery and was based on a radius of one mile from the destination facility. The one-mile radius was chosen in order to determine what level of information could be gathered with the use of ArcGIS and satellite imagery. Other tools used for the assessment of surrounding areas included OEHHA's CalEnviroScreen 4.0 and U.S. EPA's EJScreen tool.

The following information provides a summary of the assessment:

CalEnviroScreen 4.0:

- Of the 137 universal waste destination facilities used in the assessment, 67 facilities (49%) were in census tracts at or above the CalEnviroScreen 75th percentile.
- Of the 52 universal waste recyclers assessed, 24 facilities (46%) were in census tracts at or above the CalEnviroScreen 75th percentile.
- Of the 64 permitted facilities assessed, 30 facilities (47%) were in census tracts at or above the CalEnviroScreen 75th percentile.

EJScreen:

- Of the 140 universal waste destination facilities in California used in this assessment, 115 facilities (82%) were in census tracts at or above the 75th percentile.
- Of the 100 out-of-state universal waste destination facilities used in this assessment, 35 facilities (35%) were in census tracts at or above the 75th percentile.
- Of the 240 universal waste destination facilities in the United States used in this assessment, 150 facilities (63%) were in census tracts at or above the 75th percentile.
- Of the 56 universal waste recyclers used in this assessment, 43 facilities (77%) were in census tracts at or above the 75th percentile.
- Of the 74 permitted facilities, 49 facilities (66%) were in census tracts at or above the 75th percentile.
- Of the 31 out-of-state facilities that received more than 95 percent of manifested waste that was shipped out of state, four facilities (13%) were in census tracts at or above the 75th percentile.

Sensitive Receptors:

- Of the 140 universal waste destinations used in this assessment, 132 facilities (94%) were within one mile of a sensitive receptor.
- Of the 100 out-of-state universal waste destinations, 85 facilities (85%) were within one mile of a sensitive receptor.
- Of the 240 destinations that received universal waste within the United States used in this assessment, 217 (90%) were within one mile of a sensitive receptor.
- Of the 56 universal waste recyclers, 47 facilities (84%) were within one mile of a sensitive receptor.
- Of the 74 permitted facilities, 54 (73%) were within one mile of a sensitive receptor.
    - Of the 47 facilities that have a RCRA permit, 32 facilities (70%) were within one mile of a sensitive receptor.

    - Of the 24 facilities that have a standardized permit, 20 facilities (83%) were within one mile of a sensitive receptor.
    - Of the three facilities that have a state-only permit, 2 facilities (67%) were within one mile of sensitive receptor.
- Of the 31 out-of-state facilities that received more than 95 percent of manifested waste shipped out of state, eight facilities (26%) were within one mile of a sensitive receptor.

Disadvantaged Communities:

- Of the 140 universal waste destination facilities used in this assessment, 83 facilities (59%) were within SB 535 disadvantaged communities.
- Of the 56 recyclers that reported treatment of universal waste in UWED, 31 recyclers (55%) were within an SB 535 disadvantaged community.
- Of the 74 permitted facilities in California, 41 facilities (55%) were within SB 535 disadvantaged communities.
    - Of the 47 facilities with a RCRA permit, 27 (59%) were within SB 535 disadvantaged communities.
    - Of the 24 facilities with a standardized permit, 11 (46%) were within SB 535 disadvantaged communities.
    - The three facilities with state-only permits were all within SB 535 disadvantaged communities.

Out-of-Country Destinations

- 19 universal waste destinations were outside the United States.

4.4 Discussion

The analysis included in this report focuses on geographic areas near destination facilities but not near hazardous waste generators. However, DTSC recommends that future reports include a similar analysis for generators. As both generators and destination facilities manage hazardous waste, focusing on geographic analysis for only one of these excludes a crucial part of understanding the potential impacts of hazardous waste management.

Generators may have more of an impact to a community’s lived experience than hazardous waste management facilities because there are so many and because of the variety and type of hazardous waste generation activities. Certain types of generators, such as metal finishing facilities use cyanides in their processes and many generators use solvents for cleaning purposes. In 2021, there were 74 facilities with an operating hazardous waste facility permit in California while there were almost 95,000 hazardous waste generators in California. DTSC inspects the hazardous waste transporters, universal waste destination facilities,TSDFs and a very small amount of generators, while CUPAs inspect the majority of the generators. Additionally, the CUPAs ensure that businesses adequately implement the five other programs noted above. CUPAs typically inspect facilities every three years. This time frame may vary and an average CUPA inspector may have more than 300 facilities to inspect. DTSC oversees the implementation of the generator and onsite treatment program performed by the CUPAs.

An analysis of the type and number of violations that are being observed at generator locations is one that requires further research. Some common hazardous waste violations include: failure to make a hazardous waste determination, failure to label containers correctly, failure to keep copies of the manifest, failure to minimize a release of hazardous wastes or constituent into the environment storing wastes onsite longer than the required time frame and failure to have adequate training and contingency plans. These and other violations can lead to negative public health and environmental consequences.

Some other states' hazardous waste reports and/or plans have collected similar data about geographic areas surrounding facilities and have offered suggestions on how they might use the gathered information. One suggestion, based on Washington state's State Solid and Hazardous Waste Plan, is to give impacted or disadvantaged communities priority in implementing pollution prevention (P2) programs. Further research is needed to determine best uses of the collected location information, but initial recommendations include prioritizing research regarding generators to those communities that meet specific criteria, such as communities identified as impacted or disadvantaged.

Department of Toxic Substances Control

CalEPA
California Environmental Protection Agency

Draft Hazardous Waste Management Report

Implementation of California Health and Safety Code Section 25135

Section 5

5. Transportation of Hazardous Waste

In accordance with Health and Safety Code (HSC) section (§) 25135(b)(2)(C), this section includes available information on the following elements related to the transportation of hazardous waste generated in California:

- The distance between locations where hazardous waste is generated and the destination facilities to which the hazardous waste is transported.
- The transportation options available for transporting hazardous waste to each destination facility.
- The cost of transportation to each destination facility.

To complete this analysis, the Hazardous Waste Management Program (HWMP) team used available data from the Hazardous Waste Tracking System (HWTS) and consulted with DTSC's Enforcement and Emergency Response Division and various hazardous waste transporters.

More than 94,000 generators in California shipped 1.41 million tons of hazardous waste off site in 2021.[1, 2] Approximately 800 hazardous waste transporters were registered by DTSC in California in 2022. The exact number of registered transporters changes frequently because registration must be renewed every year.

5.1 Summary of Regulatory Considerations

Transportation of hazardous waste from a generator to a treatment, storage, or disposal facility (TSDF) is an important aspect of hazardous waste management in California, because transportation provides the link from cradle-to-grave. In accordance with California Code of Regulations (Cal. Code Regs.), title 22 (tit. 22), section (§) 66260.10, a hazardous waste transporter is defined as "a person engaged in the off-site transportation (or movement) of hazardous waste by air, rail, highway, or water." Regulatory requirements for the transportation of hazardous waste that requires a manifest are found in Cal. Code of Regs., tit. 22, Chapter 13 – Standards Applicable to Transporters of Hazardous Waste.

Many types of hazardous waste shipped off site from a generator must be accompanied by a hazardous waste manifest. Regulatory requirements for the transportation of this manifested waste are found in Cal. Code of Regs., tit. 22, Chapter 13 – Standards Applicable to Transporters of Hazardous Waste. However, exceptions and exemptions

[1] See Table 3.1-1
[2] 94,000 generators were identified in the HWTS database (CERS database figures differ and show more than 100,000 generators)

do exist. For example, universal wastes (such as batteries and electronic devices) are not required to be shipped with a manifest.[3] Universal wastes have their own transportation requirements in Cal. Code of Regs., tit. 22, Chapter 23. These transportation requirements for universal waste apply to any person engaged in the off-site transportation of universal waste by air, rail, highway, or water.

Manifested hazardous waste be transported only by a registered hazardous waste transporter with an EPA ID number and the proper insurance. Unlike generator EPA ID numbers, which are site and business specific, transporter ID numbers are assigned to the transportation company as a whole. This means that each individual truck uses the number issued to the company’s headquarters location and does not receive its own unique number. However, universal waste may be transported using any standard shipping service or in private vehicles. California’s universal waste regulations are based on U.S. EPA regulations, which are intended to encourage proper handling of universal waste by “eas[ing] the regulatory burden on retail stores and others that wish to collect or generate these wastes… [in order] to reduce the quantity of these wastes going to municipal solid waste landfills or combustors.”[4]

DTSC collects transportation data for manifested waste in HWTS. Universal waste is not manifested, and there is no mechanism that tracks the transportation of these types of waste. Therefore, universal waste transportation data is unavailable.

There are other regulatory considerations hazardous waste transporters must make. For example, manifested shipments of hazardous wastes may be stored at an exempt transfer facility for up to 10 days without requiring the facility to have a permit. The hazardous waste cannot be removed from its original packaging. Some facilities are not eligible for exemption due to their zoning or their location relative to certain structures.[5]

A transfer facility can include loading docks, parking areas, storage areas, and other similar areas where shipments of hazardous waste are held during the normal course of transportation. Use of more than one transfer facility during a single hazardous waste shipment could be considered incidental to normal transportation practices. Transporters must plan for logistical concerns like driver and equipment availability to ensure that the allowed storage time is not exceeded.

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[3] Cal. Code Regs., tit. 22, § 66273.52

[4] United States, Environmental Protection Agency, "Universal Waste Rule (Hazardous Waste Management System; Modification of the Hazardous Waste Recycling Regulatory Program); Final Rule” Vol. 60 #91 Fed. Reg. (May 11, 1995)

[5] Cal. Code Regs., tit. 22, § 66263.18

5.2 Analysis of the Distances Between Generation and Destination Facilities

The hazardous waste manifest required to ship most hazardous wastes records the location of the generator and the location of the destination facility. This information can be used to determine the distance between the two locations. In conducting the analysis for this section, the HWMP team considered three methods of determining the distance between locations:

- Determination of the actual route traveled.
- Determination of the most efficient route that could be traveled.
- Calculation of the physical distance from the generation location to the destination facility "as the crow flies" utilizing the Haversine formula.

Information on the actual route taken is not available. For example, if hazardous waste is transported by truck, transporters are not required to track or report the actual routes driven from load pickup to destination facility.

Transporters do track the routes of hazardous waste shipments from pickup to destination facility, but this information is not readily available to DTSC. Therefore, data on actual routes taken is not included in this report. Even if this information were shared by transporters, it may not be feasible to include in future reports, as it would require time- and labor-intensive analysis of every trip.

Software could determine the most efficient route possible, but it would not produce accurate information for this report because transporters often do not take the most efficient route for a variety of reasons, including traffic, detours, or weather. Additionally, transporters often pick up wastes from multiple generators until they have enough to deliver to an exempt transfer facility for sorting. Based on conversations with transporters, these types of issues can add significant mileage to a trip. More significantly, the most efficient route is often unavailable to transporters due to the typical routing options available for trucking. These options are discussed in more detail later in this section.

Because of these factors, the HWMP team selected the third method, the physical distance from generation location to destination facility. The team used the Haversine formula to calculate this "as the crow flies" distance.

The Haversine formula is calculated with:

$$d = 2r * \arcsin\left(\sqrt{sin^2\frac{(\varphi_1 - \varphi_2)}{2} + \cos\varphi_1 * \cos\varphi_2 * \sin^2\left(\frac{\lambda_2 - \lambda_1}{2}\right)}\right)$$

Where:

- *d* is the calculated Haversine distance,
- *r* is the radius of the earth,
- φ_1 and φ_2 are the latitudes of the generator and destination facility, respectively, and
- λ_1 and λ_2 are the longitudes of the generator and destination facility, respectively.

The HWMP team applied the Haversine formula to each hazardous waste manifest available in HWTS since 2010. This calculation yielded an average distance of 499 miles between generator and destination facility, while the median distance was calculated to be 240 miles, less than half the average distance. An average value can be skewed by outliers, while a median represents a typical value. The average distance being twice the median indicates that there were some abnormally long-distance shipments that significantly skewed the average distance upward. The team calculated average and median distances by considering each manifest, not by taking an average and median of the distances for each year. Figure 5.2-1 shows the average and median distance per year between hazardous waste generator and destination facility in California since 2010, calculated using the Haversine formula.

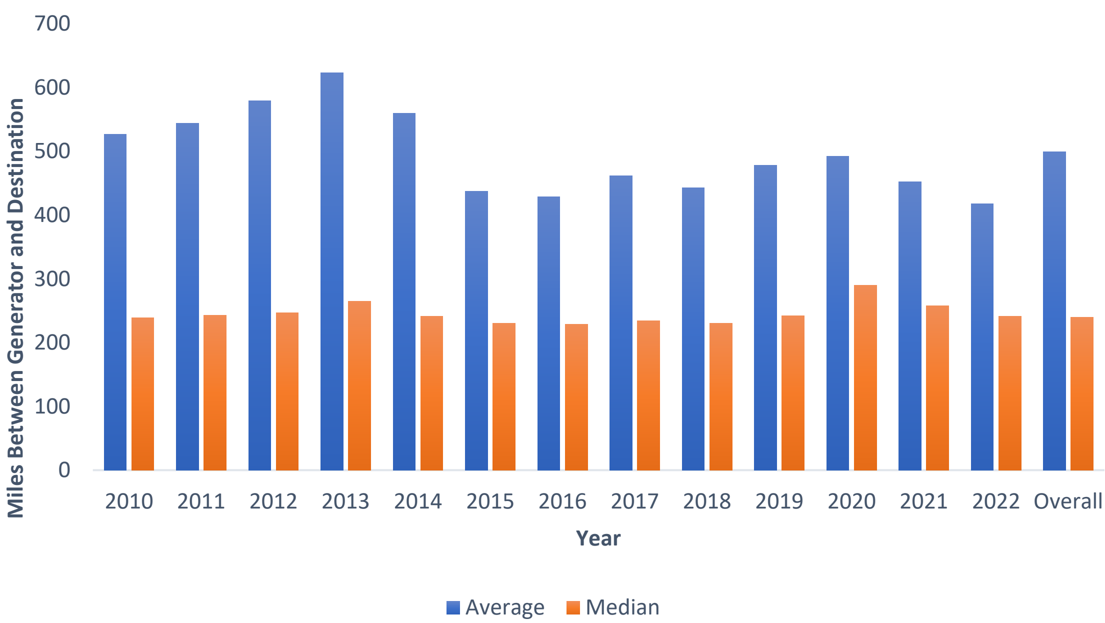

Figure 5.2-1: Haversine Distance Average and Median by Year for Waste Generated in California

Because the Haversine formula provides the calculated “as the crow flies” distance between generator and destination facility, it is an underestimation of the actual distance a transporter travels. The magnitude of the underestimate is dependent on how direct of a route the transporter takes.

5.3 Transportation Options

Hazardous waste is transported by four modes of transportation: truck, rail, ship, and air. The mode of transportation can impact the distance traveled due to the routing options available for each mode. The mode of transportation can also affect the manifest procedure.

Truck and rail transportation are far more common than ship and air transportation because overland routes are available and most destination facilities are within the contiguous United States. Modes of transportation can be used individually or together. For example, waste can be trucked to a permitted transfer station where it is later loaded into a railcar to reach its destination facility.

While a manifest is required for the transportation of most hazardous waste, it is not required for universal waste. As a result, the quantity of universal waste transported is not consistently tracked.

Gathering detailed information on the modes of transportation used is difficult because, even for hazardous waste that does require a manifest, the manifest is not required to list the mode of transportation. However, information included on the manifest can sometimes be used to infer the most likely mode used. For example, the container type must be included on the manifest, and some container types are only used in certain modes of transportation, such as dump trucks, hopper or gondola cars, and tank cars. Other container types, such as metal boxes and wooden drums, are not specific to any one mode of transportation. In these cases, inferring the transportation method is difficult.

In general, the transporter must ensure that the manifest accompanies the hazardous waste.[6] For rail transportation, the manifest is recorded at the point of hand-off from a trucking transporter to the rail transporter and then shipped separately to the next non-rail transporter. Any movements during rail transportation, including changes from one train line to another, are tracked by railroad waybills and are not tracked on the manifest. If there is no subsequent non-rail transporter, the manifest is shipped to the final TSDF or other destination facility.[7] When hazardous waste is transported by ship, a

[6] Cal. Code Regs., tit. 22, § 66263.20(c)
[7] Cal. Code Regs., tit. 22, § 66263.20(i)

manifest does not need to accompany the hazardous waste, but other shipping papers are required to accompany the waste.[8]

5.3.1 Trucking Considerations and Routing Options

During analysis of the hazardous waste transportation options available, DTSC determined that three routing approaches are typically used for trucking:

- Direct transportation
- Load-building transportation
- Consolidated manifesting

In the direct transportation routing approach, hazardous waste is transported directly from the generator to the destination facility, as seen in Figure 5.3-1. This may occur if a generator has contracted with a transporter to take its hazardous waste to a single TSDF or other destination facility without additional stops. If there is not enough waste to fill the truck, the transporter will likely require the generator to pay the cost of an entire truckload because some transport costs, such as fuel and driver pay, do not change even if a truck is not full.

The direct transportation approach is the most suited to the Haversine formula, but there is still a difference between the Haversine-calculated distance and the actual distance traveled, because roads do not extend straight from point-to-point, and hazardous waste drivers may not always take the most direct route due to weather or road conditions. In addition, transporting hazardous waste often involves routing restrictions. For example, transporters delivering to the Clean Harbors Buttonwillow landfill are required to take the hazardous waste route around the town of Buttonwillow, California, even though driving through the town may be the most direct route to the landfill.[9] There are also some tunnels that trucks carrying hazardous materials or wastes are not allowed to use, causing the transporter to take a more circuitous route.

Figure 5.3-1: Example Schematic of Direct Transportation

[8] Cal. Code Regs., tit. 22, § 66263.20(h)
[9] Laidlaw Environmental Services (Lokern), Inc. Lokern Facility Modification Final Supplemental Environmental Impact Report Volume 1: Revised Draft Supplemental Environmental Impact Report. Ogden Environmental and Energy Services Co., Inc. August 1994.

Load-building transportation is used when a generator does not generate enough hazardous waste to fill a truck. In this case, a transporter may "load-build" by picking up hazardous waste and their accompanying manifests from multiple generators before driving to a TSDF or other destination facility, as seen in Figure 5.3-2.

Load-building may also be used even if a generator can fill a truck but the load is made up of different types of hazardous waste. The transporter may bring the waste to an intermediate facility[10], where the waste is reorganized (e.g., sorted by waste type) and sent to different TSDFs or destination facilities.

The use of intermediate facilities may also involve different types of trucking companies. Local truckers may initially transport hazardous waste from the generator to an intermediate facility, and long-haul truckers may then transport the waste to the final TSDF or other destination facility, or possibly to another intermediate facility.

Due to the complex nature of the load-building routing approach, the calculated Haversine distance is not likely representative of the actual distance driven. As noted above, when the transporter signs the manifest, the EPA ID number for that transporter is not address specific, so it is unknown where each transfer of hazardous waste occurs.[11] For example, large transportation companies have EPA ID numbers that identify them as having their headquarters in another state. It would not be unusual to be a transporter EPA ID beginning with MAD, indicating that their headquarters is in Massachusetts. As such, determining the total distance traveled between the generator, any intermediate facilities, and the final TSDF or destination facility would require a much more complicated analysis of each manifest. Considering that there are 400,000 to 500,000 manifests created annually and the routing method is not known, conducting an analysis of the actual route driven is likely not feasible.

[10] Intermediate facilities can include both exempt and non-exempt transfer stations.
[11] Multiple drivers that work for a single transporter do not need to sign the manifest, so waste hand-offs between different drivers working for the same company are not recorded on the manifest.

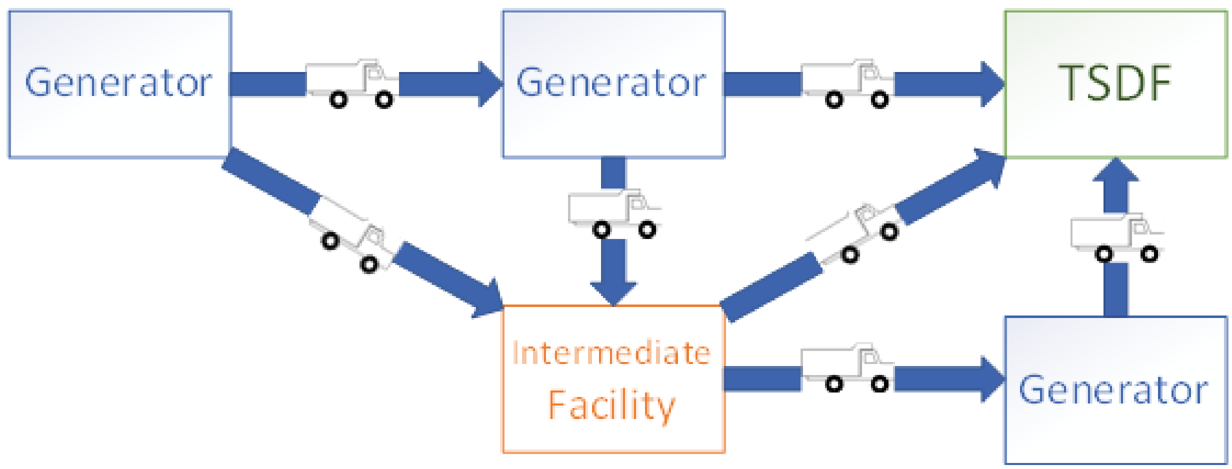

Figure 5.3-2: Example Schematic of Load-Building Transportation

Consolidated manifesting – formerly known as modified manifesting or “milk runs” – involves a registered transporter taking specific types of hazardous waste from multiple generators and recording them on a single manifest rather than using a separate manifest for each generator. The transporter leaves a receipt with the generator identifying the manifest number on which its waste is being shipped, but these manifests do not list the address or identification of the individual generators. Instead, the transporter identifies itself as the generator. Therefore, when a consolidated manifest is used, HWTS has no information about the actual generators of the waste listed on the manifest. The generator information is available in the Transporter Quarterly Report database, but this data is currently in a spreadsheet format that cannot be readily analyzed.

Consolidated manifesting is used only for a limited number of specific waste streams. California HSC § 25160.2(b) and HSC § 25160.2(c) describe the eligible waste streams and the procedures allowed. Some eligible waste streams include used oil, antifreeze, and brake fluid. Figure 5.3-3 is an example schematic of consolidated manifest transportation.

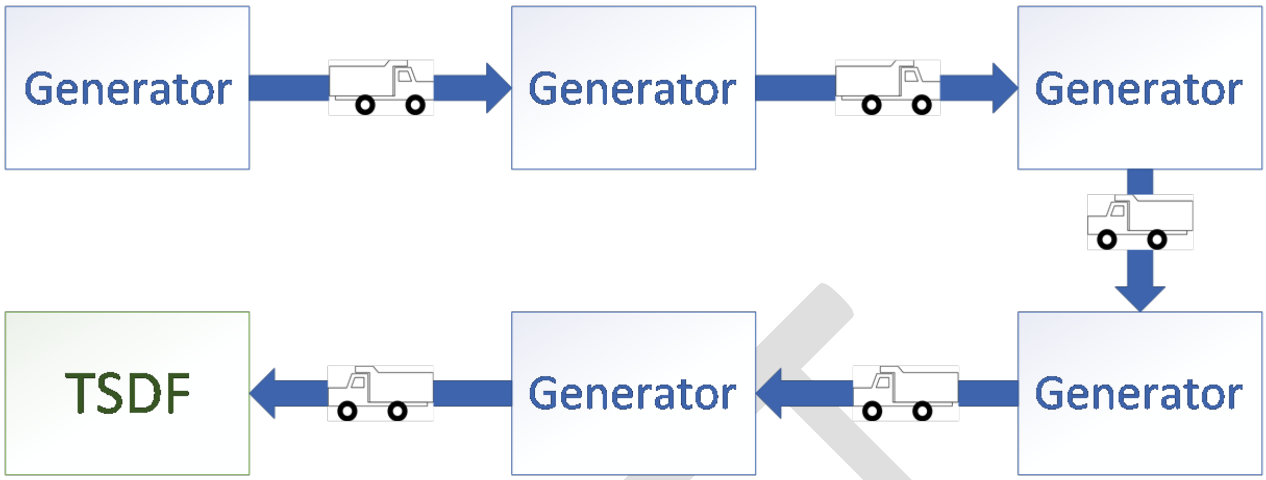

Figure 5.3-3: Example Schematic of Consolidated Manifest Transportation

5.3.2 Rail Considerations and Options

Hazardous wastes can be transported solely by rail if there is a rail spur at the generator's location and at the TSDF or other destination facility. However, most rail transportation of hazardous wastes is used in combination with trucks. In this situation, truck transportation brings waste from the generator to a rail spur and/or from a rail spur to the TSDF or other destination facility.

Figure 5.3-4 shows the major rail lines in the United States, with different colors representing the major rail companies that own those lines. There are a limited number of national rail lines, and the western half of the country has a lower density of rail lines than the eastern half of the country.

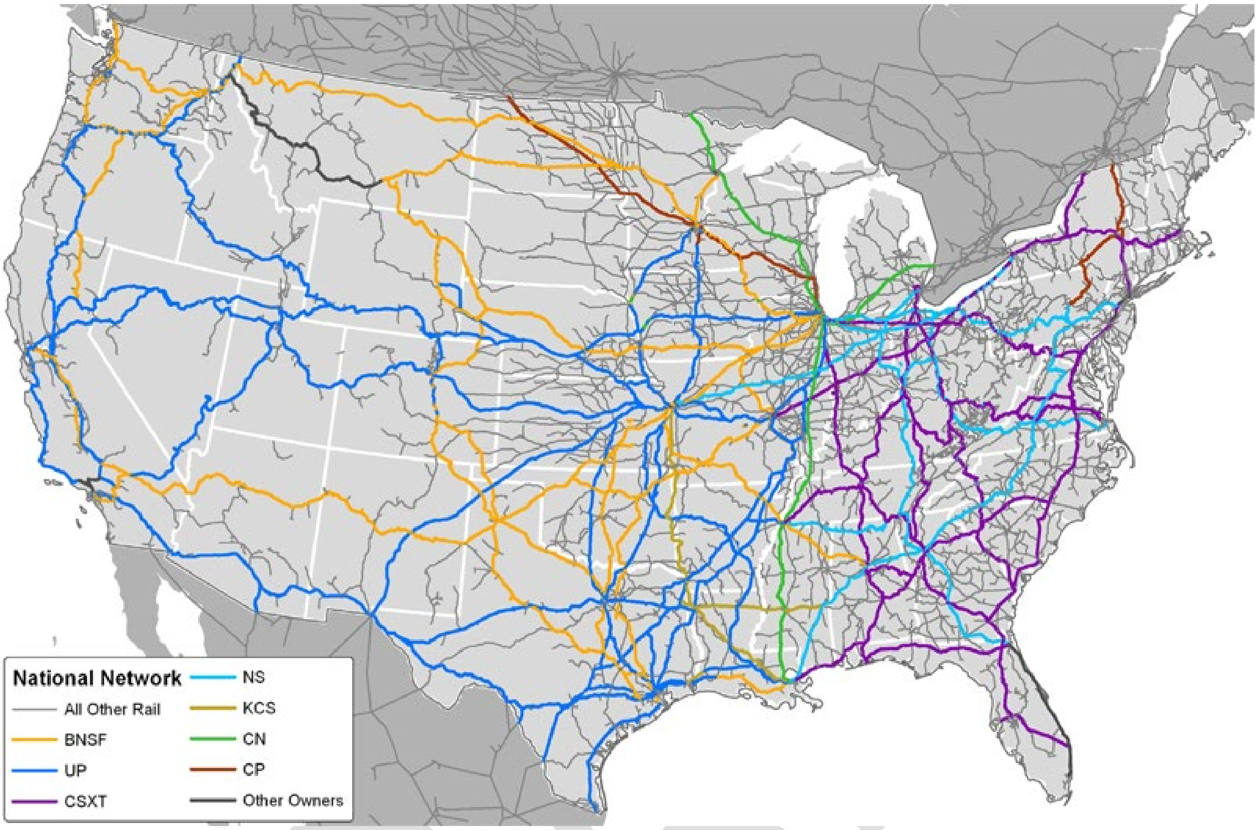

Figure 5.3-4: Map of National Rail Lines by Company[12]

In cases where hazardous waste is transported by both truck and rail, hazardous waste containers are not typically opened during the transfer from the truck to the train. Hazardous waste can be packaged in an intermodal container that can be moved from the truck to the train car with a forklift. Other types of containers, such as drums, can be transferred from the truck to the rail car without opening the drums. Often, rail cars are owned by a third party – neither the trucking company nor the rail company – and are leased by the hazardous waste transportation company.

Because there is a limited number of rail lines, hazardous waste that is transported by rail may travel a route that is not as direct as a truck could. Nonetheless, rail transport can cost far less per mile traveled. Bulk shipments sent exclusively by rail can cost as little as one third of what a shipment sent exclusively by truck would cost per ton/mile. A hybrid model, with truck transport bringing material to and from a rail spur, can still cost as little as half that of the same shipment being transported solely by truck.[13]

[12] "Freight." – Mississippi Export Railroad, Website Link.
[13] Rsiadmin. "Comparing the Costs of Rail Shipping vs Truck." RSI Logistics, 24 Mar. 2022, Website Link.

Fuel efficiency is one reason rail transport is usually less expensive than truck transport. Trains can be up to four times more fuel-efficient than trucks,[14] resulting in substantial fuel savings. Labor costs are another significant factor. Rail transport requires relatively few workers given the large number of cars that can be in a single train, while each individual truck needs a driver. Therefore, when feasible, rail can be more cost effective per ton/mile.

5.4 Transportation Costs

Estimating the cost of transportation is difficult. Using information from hazardous waste manifests to determine a dollars-per-mile cost would require too many situational assumptions to provide an accurate understanding. Instead, DTSC considered two primary approaches to gather cost data – requesting information from transporters or requesting information from generators. For this analysis, DTSC consulted with various transporters because pricing is established by transporters.

Unfortunately, transporters were not willing to provide information regarding a cost per mile traveled, due in part to the potential that it would set a cost expectation with their customers. Transporters were also reluctant to publish pricing information that competitors might use to attain a competitive advantage. Therefore, DTSC does not have access to a calculated cost per mile from hazardous waste transporters.

In addition to competitive concerns, transporters' pricing can fluctuate substantially, as there are many factors that contribute to the cost of hazardous waste transportation, including:

- Type of hazardous waste being transported
- Fuel prices
- Driver availability and type (local vs long haul)
- Urgency and size of load
- Transportation company model (transportation only or "full service," which can offer transportation, treatment, and disposal)

The type of hazardous waste is also an important consideration for pricing because some types of waste require specific types of equipment or handling. For example, corrosive hazardous waste liquids need special, lined containers on trucks, while non-corrosive hazardous wastes can be transported in less specialized containers that may cost less to operate and maintain. Further, certain types of hazardous waste must be treated or managed in certain disposal facilities, such as incinerators, which will determine the TSDF or destination facility selected.

[14] "Freight Rail Facts & Figures." Association of American Railroads, 27 Sept. 2022, Website Link.

There are many fluctuating variables that influence the cost of hazardous waste disposal. Fuel prices, labor costs and transporter availability factor into fluctuating transportation costs. The size of the load and urgency of the pickup will impact cost. For example, if a generator needs a pickup on short notice and does not have enough for a full load, the transporter may charge more for the expedited service and for transporting less than a full load.

The type of transporter may factor into the pricing. Small to medium size transporters that focus on local projects may price differently than larger transporters. Larger transporters may be part of a network that includes intermediate facilities, such as permitted TSDFs, allowing for different pricing structures based upon the other services they may be able to offer.

Additional research could involve consulting with various generators to obtain information on the actual costs they have incurred. However, this may only provide a snapshot of pricing in a specific year and be representative of only a few individual projects. Considering there were approximately 94,500 generators recorded in HWTS in 2021, this approach may not provide an accurate understanding of broad hazardous waste transportation costs.

5.5 Destination Facility Selection

The Commerce Clause has been interpreted to mean that states cannot tax interstate commerce without prior permission from Congress, which prevents DTSC from creating policies that favor in-state disposal over out-of-state disposal.[15] DTSC therefore does not have the authority to determine the hazardous waste destination facility. Hazardous waste generators must select the destination facility for the hazardous waste they are shipping offsite. The role of the transporter is solely to bring hazardous waste from the generator to the destination facility. However, transporters can advise generators, as they often have broader knowledge than generators regarding which facilities are able to manage the type of waste a generator needs to send off site. It is ultimately the generator's decision where to send their waste, taking into consideration where it can be lawfully managed. Some destination facilities also have their own transportation business.

There are many considerations generators use in selecting a TSDF or other destination facility. Total transportation costs increase with distance due to labor and fuel costs, so a generator might reasonably assume a TSDF or destination facility that is closer would be more cost effective than one farther away. However, different TSDFs or destination

[15] Levinson, A (1999), "NIMBY taxes matter: the case of state hazardous waste disposal taxes," Journal of Public Economics 74, 31–51

facilities may have different disposal fees, which could incentivize a generator to send its hazardous waste to a lower-fee facility that is farther away.

Between January 2010 and May 2022, the percent of California's hazardous waste remaining in state for management has decreased. Over that 12-year period, a total of 21.05 million tons of manifested hazardous waste was generated in California.[16] 81 percent (17.02 million tons) of this was non-RCRA hazardous waste and 19 percent (3.79 million tons) was RCRA hazardous waste.[17] The remainder (0.24 million tons) was not classified on hazardous waste manifests. Waste that is not classified is a data gap, since all hazardous waste in California should be classified as either RCRA or non-RCRA.

In 2010, 62 percent of manifested hazardous waste generated in California remained in California for management (1.09 million tons out of 1.75 million tons). In 2021 (the most recent full year analyzed), 52 percent of manifested hazardous waste generated in California remained in California for management (0.73 million tons out of 1.41 million tons).[18] Because California regulates more wastes as hazardous than the U.S. EPA does under RCRA, most other states do not identify these non-RCRA wastes as hazardous in their states, and they are not required to manage them in hazardous waste facilities. As a result, California generators of non-RCRA hazardous waste can realize reduced disposal costs by sending their waste to these out-of-state facilities. Some states, however, do manage California's non-RCRA hazardous waste in hazardous waste facilities.

While most hazardous waste generated in California is managed in state, Utah, Arizona, and Nevada are the top three other states that receive California-generated hazardous waste. Utah and Arizona do not recognize California's non-RCRA wastes as hazardous and manage them at non-hazardous waste facilities. While 81 percent[19] of the hazardous waste California generates is non-RCRA waste, it comprises 89 percent[20] of the manifested hazardous waste sent to Utah and 95 percent[21] of the manifested hazardous waste sent to Arizona since 2010.

Nevada is a reciprocity state, which means it manages waste according to how it is identified in the origination state. So, even though California's non-RCRA hazardous wastes are not identified as hazardous in Nevada, Nevada requires that those wastes be disposed of in hazardous waste management facilities. The proportion of non-RCRA

[16] See Section 3.1.1
[17] See Section 2.1.5
[18] See Table 3.1-1
[19] See Section 2.1.5
[20] See Section 3.1.2.1
[21] See Section 3.1.2.2

waste that Nevada accepts from California is 57 percent,[22] which is lower than the 81% of all California generated hazardous waste that is non-RCRA. The data indicates that California generators preferentially send RCRA waste to Nevada over non-RCRA waste. This could be both due to the reciprocity agreement and due to Nevada having a TSDF that can accept certain wastes from specific industries.

Because some hazardous wastes have specific treatment or disposal requirements, generators may have no in-state TSDF or destination facility options. For example, some wastes such as polychlorinated biphenyls (PCBs) and halogenated organic compounds (HOCs) at certain concentrations must be incinerated,[23] but there are no commercial hazardous waste incinerators in California. The closest hazardous waste incinerator is in Utah, as shown in Figure 5.5-1. Therefore, hazardous wastes that must be incinerated must be transported out of state to a permitted hazardous waste incinerator. Also, an incineration facility may have a backlog and be temporarily unavailable to accept additional hazardous waste, necessitating the selection of a different facility if one is available.

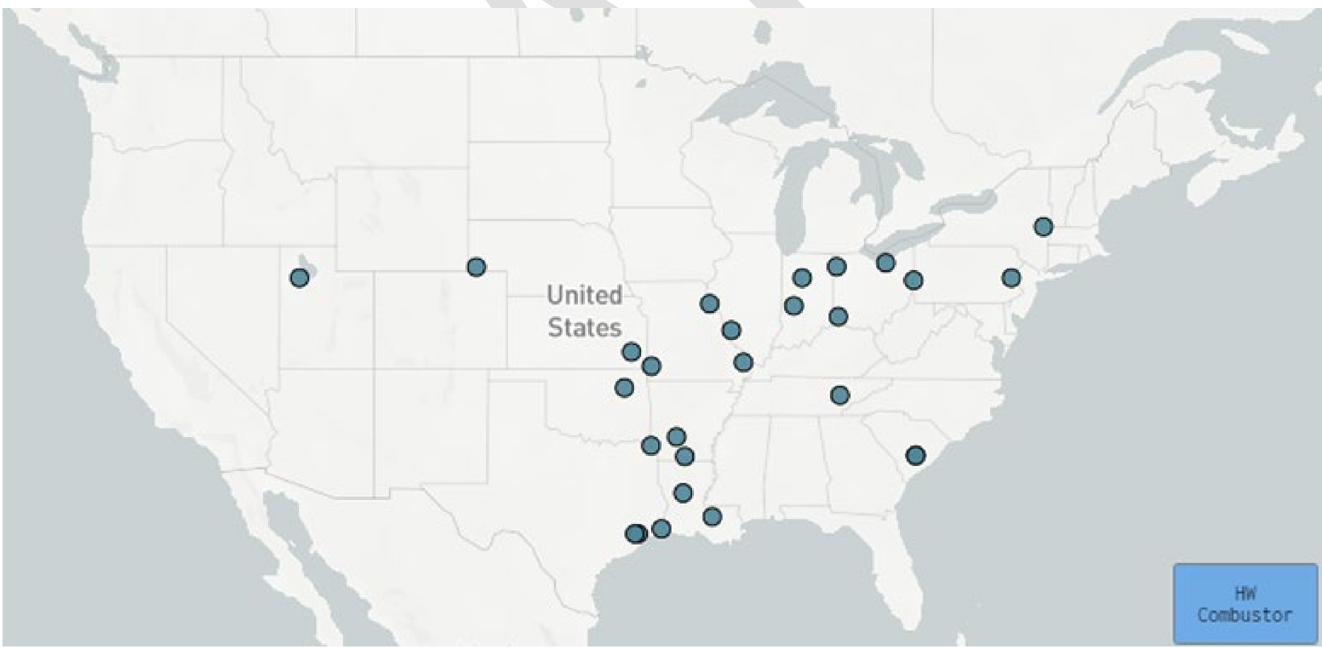

Figure 5.5-1: Map of Hazardous Waste Incinerators[24]

[22] See Section 3.1.2.3
[23] Cal. Code Regs., tit. 22, § 66268.42
[24] "Map of Commercial Waste Combustors in the U.S." EPA, Environmental Protection Agency, [Website Link].

5.6 Fee Changes

Recent changes to the fee structure for disposal of hazardous waste could influence transportation patterns, including the selection of a destination facility. These changes per California HSC § 25205.5.1, include:

- Changes to all fee rates, effective January 1, 2022
- Repeal of the generator fee, effective January 1, 2022
- Creation of the generation and handling fee at $49.25 per ton or each fraction of a ton of hazardous waste generated, effective January 1, 2022
- Repeal of the disposal fee, effective June 30, 2022

5.7 Summary and Future Work

Per HSC § 25135(b)(2)(C) this section addressed the following topics:

- Information on the distance between generators and the destination facilities to which they send their hazardous waste
- The transportation options available for shipping hazardous waste to each destination facility
- The cost of transportation to each destination facility.

It is difficult to accurately calculate the distance traveled by transporters between generators and destination facilities. Using hazardous waste manifests available in HWTS between January 2010 and May 2022, DTSC used the Haversine formula to calculate the straight-line distance between each generator and destination facility for each manifest. This calculated distance is an underestimation of the total distance traveled, as it does not consider the actual routes available or used. The average distance between generator and destination facility since 2010 was determined to be 499 miles, while the median was 240 miles. Because an average, or mean, is the sum of all data divided by the number of data points, the figure can be skewed by atypical values, such as a few very long-distance shipments to out-of-state incinerators. This likely explains the average distance being twice the median distance. The median figure better represents a typical shipment of hazardous waste.

There are many transportation options available to generators. There are approximately 800 registered transporters in California, though this number changes frequently because registration is only valid for a year. Hazardous waste can be transported by air, rail, truck, or ship. In California, air and ship transportation of hazardous waste are rarely used; hazardous waste is primarily transported using truck or rail since overland routes are available. Transportation by truck can utilize multiple routing strategies, some of which can make the calculated Haversine distance a significant underestimation. Rail transportation can be less expensive than truck transportation, but there is a limited number of rail lines and rail spurs in California. Sometimes, a hybrid transportation model is used. In these cases, one truck brings hazardous waste to a rail spur near the generator and another truck picks it up at a rail spur near the destination facility.

DTSC interviewed hazardous waste transporters to determine the cost per mile of transportation, but none would provide a figure because pricing is considered confidential business information. Many other factors also make the cost per mile difficult to determine. For example, fuel and labor costs fluctuate, and some wastes, such as corrosive waste, require expensive specialized equipment.

There are many potential areas of future research into the transportation of California's hazardous waste. Examples include:

- Analyzing the new fee structure to determine whether it will change hazardous waste transportation patterns or destination facility selection
- Researching the relative impacts on EJ communities of hazardous waste transportation, hazardous materials transportation, and overall commercial transportation
- Surveying generators regarding how they select a transporter, how they select a destination facility, and whether there is transportation pricing information that can be shared.

Department of Toxic Substances Control

CalEPA
California Environmental Protection Agency

Draft Hazardous Waste Management Report

Implementation of California Health and Safety Code Section 25135

Section 6

6. Analysis of Pollution Prevention Programs

In accordance with Health and Safety Code (HSC) section (§), 25135(b)(3), this report section includes available information and discussion of the following elements related to pollution prevention (P2):

- A summary of the past and current Department of Toxic Substances Control (DTSC) P2 programs
- An analysis of national and international P2 programs

The purpose of this section is to inform recommendations for changes to the implementation of HSC Article 11.8 (starting at § 25244) and Article 11.9[1] (starting at § 25244.12). These recommendations are to be included in the Hazardous Waste Management Plan in accordance with HSC § 25135(d)(7).

6.1 Summary of HSC Articles 11.8 and 11.9

Pollution prevention has been an important goal of DTSC for decades. DTSC's program was established in the 1980's with California Health and Safety Code Articles 11.8 and 11.9. Changes were made to these articles in 2012, which made implementation of the requirements discretionary and contingent on funding, with the exception of facility reporting requirements. These statutory changes were made during the reorganization of DTSC's P2 program between 2012 and 2013.

HSC Article 11.8 is called the Hazardous Waste Reduction, Recycling, and Treatment Research and Demonstration Act of 1985. The article states that the generation of hazardous waste is to be reduced or eliminated and that waste that is generated should be recycled, treated, or properly disposed of in a manner that minimizes impacts to human health and the environment. Every generator of hazardous waste is required by the Act to submit a report at least once every two years on the changes in volume and toxicity of waste achieved through waste reduction.[2] Per the Act, the Department established a Hazardous Waste Technology, Research, Development, and Demonstration Program. One purpose of this program was to provide grants to research, develop, and demonstrate P2 technologies.[3] Any grant funds that resulted in a commercially viable technology were to be repaid by the entity that received the grant, and DTSC was to receive a percentage of the royalties.[4] All grant funds have been dispersed, and there is no additional funding available. Article 11.8 is contingent upon available funding per HSC § 25244.01(a). The reporting requirement for generators in HSC § 25244.4 remains in place.

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[1] HSC Article 11.9 is also called SB 14
[2] HSC § 25244.4
[3] HSC § 25244.5(a)
[4] HSC § 25244.5(b)(2)

HSC Article 11.9 is called the Pollution Prevention and Hazardous Waste Source Reduction and Management Review Act. The intent of the article is to promote the reduction of hazardous waste at its source and, where this is not feasible or practicable, to encourage recycling. If neither reduction nor recycling of hazardous waste is feasible, the statute requires the waste to be treated in an environmentally safe manner.[6] DTSC's duties in implementing Article 11.9 are contingent upon, and limited to, the availability of funding per HSC § 25244.13.1.

Pollution prevention is defined in HSC Article 11.9 as the reduction of chemical sources that have adverse impacts on public health and the environment, including, but not limited to, source reduction.[7] Source reduction is defined as either an action that causes a net reduction in the generation of hazardous waste or an action taken before the hazardous waste is generated that results in a lessening of the properties that cause it to be classified as a hazardous waste.[8] Source reduction includes, but is not limited to, input changes, operational improvements, production process changes, and product reformulation.[9] Source reduction does not include actions taken after the hazardous waste is generated, actions that merely concentrate the hazardous waste to reduce its volume or that dilute it to reduce its hazardous characteristics, actions that shift hazardous wastes from one environmental medium to another, or treatment.[10]

Generators of hazardous waste are required to produce certain documents every four years if they routinely generate, through ongoing processes and operations, more than 12,000 kg of hazardous waste in a calendar year or more than 12 kilograms of extremely hazardous waste in a calendar year.[11] These required documents include a source reduction evaluation review and plan,[12] a summary progress report,[13] and a hazardous waste management performance report.[14]

The source reduction evaluation review and plan must identify routinely generated waste streams that meet certain criteria,[15] estimate quantities generated, and evaluate potentially viable source reduction approaches, including input changes, operational improvements, production process changes, and product reformulations.[16] The source

[6] HSC § 25244.13(f)
[7] HSC § 25244.14(g)
[8] HSC § 25244.14(i)(1)
[9] HSC § 25244.14(i)(2)
[10] HSC § 25244.14(i)(3)
[11] HSC § 25244.15(d)(1)
[12] HSC § 25244.19(a)
[13] HSC § 25244.19(b)(10)
[14] HSC § 25244.20(a)
[15] HSC § 25244.19(b)(3)
[16] HSC § 25244.19(b)(4)(a) and (b)

reduction evaluation review and plan must also include an evaluation of the effects of the chosen source reduction method and a timetable toward implementation.

The summary progress report must briefly summarize the results of implementing source reduction methods. The hazardous waste management performance report must include information from the baseline reporting year, the current reporting year, as well as information on factors affecting hazardous waste generation in the current year.[17] While DTSC's duty to implement Article 11.9 is contingent upon, and limited to, the availability of funding, this does not eliminate any requirements of Article 11.9 that are imposed upon generators.[18] Generators originally sent the documents to DTSC, but the documents must now be available onsite to any inspection authority upon request.[19]

Article 11.9 also created the California Pollution Prevention Advisory Committee to implement Article 11.9 and assess the performance of DTSC's Pollution Prevention Program. The committee was to be comprised of members with a variety of backgrounds, including the directors of several government agencies (such as DTSC), representatives of industry, and representatives of environmental advocacy organizations. The committee advised the Department and assisted in the planning and prioritization of P2 activities.

6.2 Overview of DTSC's Former Pollution Prevention Program

California HSC Article 11.8 and Article 11.9 formed the basis for the creation of DTSC's Pollution Prevention (P2) program in the late 1980s. The P2 program was disbanded in 2012-2013 and reimagined into DTSC's Safer Consumer Products program. The P2 program worked toward the Department's aim of promoting green technology and seeking continuous improvement in California's sustainability. The P2 program operated under successive two-year workplans that described which industries to target for source reduction projects, the goals of those projects, and the results of past projects.

A Source Reduction Advisory Committee provided guidance for the P2 program. The Committee was comprised of a variety of industry representatives, environmental activists, and government agency employees. The responsibilities of the Committee included:

- Reviewing the P2 program's two-year workplans
- Evaluating the performance of the P2 program

[17] HSC § 25244.20(b)
[18] HSC § 25244.13.1(a) and (b)
[19] HSC § 25244.18(a)

- Making recommendations concerning program activities, funding priorities, and legislative changes.[20]

During its existence, the P2 program administered a variety of projects. DTSC measured the success of individual projects by evaluating their real-world environmental impacts against key metrics, including source reduction effectiveness, reduction of hazardous chemicals use in consumer products, and advancement of environmental justice goals.

One major aspect of the P2 program was reviewing the reports and plans from hazardous waste generators, as required by HSC Articles 11.8 and 11.9, to prepare source reduction assessments on an industry-by-industry basis. The assessments included information about each business, major waste streams, pollution prevention accomplishments, and projections for future waste generation. Industry assessments were also included in each of the P2 program's two-year workplans.

6.2.1 Former DTSC P2 Program Example Projects

Rather than mandating hazardous waste reduction, the P2 program worked with businesses to accomplish source reduction goals. One example is an initiative that created Hazardous Waste Minimization Checklists for businesses. A checklist for paint formulators, for example, included suggestions on maximizing solvent and filter life, using high-pressure but low-volume hoses for cleaning, and using a counter-current cleaning system.[21] These suggestions saved businesses money by reducing the need for hazardous waste disposal and reducing the need to purchase raw materials by improving efficiency. In addition, the P2 program dispensed grants to encourage the development of new technologies. Some of the P2 grants resulted in the demonstration of new technologies that reduced the volume or hazardous nature of waste or provided recycling or treatment options for different industries.

DTSC's P2 program was primarily focused on source reduction efforts, and experienced many successes. As an example, California's Incinerable Hazardous Waste Minimization Project specifically targeted the state's largest generators of waste requiring incineration. Because there are no commercial hazardous waste incinerators in California, all waste requiring incineration must be shipped out of state. Of the 57 facilities identified as top priority, 39 signed a voluntary agreement to work with DTSC in exchange for technical and regulatory assistance. By 1992, those 39 participating

[20] HSC § 25244.15.1
[21] California, Department of Toxic Substances Control, "Hazardous Waste Minimization Checklist & Assessment Manual for Paint Formulators" Doc No. 403 (May 1991)

facilities had reduced incinerable waste generation by 53 percent compared to 1987 (92,394 tons of incinerable waste reduced to 43,119 tons). These generators were able to reduce their incinerable waste in a variety of ways. For example, one aircraft company used a corrosion-resistant paint that required the use of a catalyst and, therefore, had a shelf life of only eight hours. Paint not used within this time frame had to be disposed of. Because less than 2-ounces of paint was typically used per shift, the company switched from 4-ounce to 2-ounce paint containers, reducing the amount of unused paint that was wasted.[22] The significant reduction of incinerable waste was a major success for the businesses that participated in the project, as well as for the P2 program.

Recycling was a secondary goal of California's P2 program under Article 11.9, even though recycling is not strictly part of pollution prevention. There were many successes that improved hazardous waste recycling. For example, one Hazardous Waste Reduction Technology Demonstration Project investigated the recycling of spent fluorescent lamps. Fluorescent lamp bulbs have phosphor powder that contains mercury, cadmium, and antimony, which classifies the bulbs as hazardous waste. The project demonstrated a process that resulted in glass and metal end caps that could be recycled as non-hazardous waste. The recycling process significantly reduced the amount of hazardous waste, as only the recovered phosphor powder was hazardous instead of the entire bulb.[23] However, recycling facilities were required to obtain permits from DTSC to conduct these activities, which was a barrier for businesses to conduct the recycling.

Treatment of hazardous waste is a tertiary area of research under Article 11.9, though also not strictly part of pollution prevention. The P2 program administered several Remedial Technology Pollution Demonstration Projects for site cleanups, examining remedies like the treatment of contaminated materials to render them non-hazardous. For example, one project examined the use of sodium bisulfite solution to reduce the hazardous nature of soil contaminated with hexavalent chromium by reducing it to less hazardous trivalent chromium. The project demonstrated a 95.8 percent reduction in hexavalent chromium in the soil, reducing its concentration below hazardous levels.[24] Unfortunately, there is no documented follow up to this project, so DTSC has been

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[22] California, Department of Toxic Substances Control, "Pollution Prevention 1993: A Year in Review"
[23] California, Department of Toxic Substances Control, "Hazardous Waste Reduction Technology Demonstration Project Report: Demonstration of Spent Fluorescent Lamp Processing." Doc No. 1215 (June 1992).
[24] California, Department of Toxic Substances Control, "Remedial Technology Demonstration Project Report: Chemical Reduction of Hexavalent Chromium Contaminated Soils for a Site in Bakersfield, California." (June 1991).

unable to determine why sodium bisulfite solution never became widely used. This could be a matter for further study.

Another Hazardous Waste Reduction Technology Demonstration Project investigated whether boiler fly ash could be used in cement manufacturing to eliminate the need to dispose of it as a hazardous waste. While the project was proven to be technically successful, the cost of using fly ash in comparison with other raw materials was not feasible. Another hindrance was that the use of fly ash in the cement may have been prohibited by the use constituting disposal regulations.[25] As a result, fly ash was only used in cement for the duration of the demonstration project and its use was discontinued after the demonstration was complete.[26]

Despite the P2 program's successes, it did not result in the adoption of viable alternatives at an industry-wide scale. Accomplishments were typically limited to specific industries or were implemented by so few generators that there were no significant reductions to the overall quantity of waste generated in California. Instead, reductions were generally limited to specific projects or companies.

6.2.2 P2 and Safer Consumer Products

By the end of 2013, DTSC redirected resources from the P2 program to support the Safer Consumer Products (SCP) program and other hazardous waste program needs. Concurrently, the P2 statutes were amended to give DTSC discretion as to whether to conduct P2 activities that had previously been mandated. Though the P2 and SCP programs are both intended to reduce potential harm from hazardous chemical use, their focuses are different. The P2 program focused on providing guidance to businesses to reduce the generation of hazardous waste. The SCP program focuses not on waste but on promoting safer alternatives and reducing hazardous chemicals in consumer products.

The SCP program is also different from the P2 program in that it has regulatory authority over businesses. The P2 program was almost entirely voluntary and had no authority to compel businesses to reduce hazardous waste generation, nor did it have adequate resources to incentivize P2. HSC Articles 11.8 and 11.9 remain in effect, though unfunded, and still require businesses to write hazardous waste generation and reduction documents, but there have never been any requirements that businesses

[25] Any P2 proposals that investigated potential options for reducing or managing wastes would have to comply with regulations.
[26] California, Department of Toxic Substances Control, "Hazardous Waste Reduction Technology Demonstration Project Report: Boiler Fly Ash Used as a Feedstock in the Manufacture of Portland Cement" Doc No. 1212 (June 1992)

reduce hazardous waste generation. The SCP program, in contrast, has regulatory authority over specific Priority Products that contain Chemicals of Concern. The program can require manufacturers to discontinue the use of Chemicals of Concern if a safer alternative exists that is functionally acceptable and technically and economically feasible. Even if no safer alternative exists, SCP can ban a Priority Product if the product's social utility does not outweigh its adverse impacts.[28] Additionally, the SCP program can require manufacturers of Priority Products to conduct additional research, provide hazard and safe handling information to DTSC or to consumers, or develop and implement stewardship programs for products that become hazardous waste at their end of life.

6.3 Analysis of National and International Pollution Prevention Programs

Many P2 programs exist nationally and internationally. The United States Environmental Protection Agency (U.S. EPA) administers a P2 program and defines P2 as any practice that reduces, eliminates, or prevents pollution at its source before it is created. U.S. EPA's exclusive focus on source reduction is different from DTSC's former P2 program, which also had recycling and treatment as stated pollution prevention goals, though lower in priority than source reduction.

Like many other P2 programs, the U.S. EPA program encourages reduction in the use of chemicals, energy, and water to make processes less resource intensive. DTSC's former P2 program was primarily focused on hazardous waste reduction rather than on other environmental goals like reducing energy and water use.[29]

U.S. EPA administers grants to support P2 programs that provide technical assistance to businesses that are unable to reduce pollution at its source due to a lack of information. Grant recipients must provide these businesses with training in source reduction techniques. U.S. EPA has identified five industrial sectors as National Emphasis Areas (NEA) for its grant program:[30]

1. Food and beverage manufacturing and processing
2. Chemical manufacturing, processing, and formulation
3. Automotive manufacturing and maintenance
4. Aerospace product parts manufacturing and maintenance
5. Metal manufacturing and fabrication

[28] Cal. Code Regs., tit. 22 § 69506.5
[29] United States, Environmental Protection Agency. "Learn About Pollution Prevention." Website Link. Accessed 16 August 2022.
[30] United States, Environmental Protection Agency. "P2 National Emphasis Areas (NEAs)." Website Link. Accessed 16 August 2022.

In addition, U.S. EPA emphasizes support for pollution prevention on Tribal lands and Alaskan native villages even if the P2 program does not specifically support any of the five NEA industrial sectors.

For a two-year funding cycle from 2022-2023, the U.S. EPA P2 program is administering two grant programs based on two federal funding sources. One program requires a 50 percent match in funding from the grant recipient, with an exception for Tribal governments. This program will award up to 20 grants, with individual awards of up to $800,000 for the two-year funding period. The other program does not have a matching requirement and awards 50 grants with a maximum individual award ceiling of $350,000. The grants must meet one of two objectives: the grant applicant must provide technical assistance to businesses/facilities about source reduction techniques; or the grant applicant must identify, develop, document, and share P2 best management practices and innovations.

U.S. EPA administers another grant program called Source Reduction Assistance (SRA), which supports research, experiments, surveys, demonstration projects, education, and training related to source reduction approaches. SRA's matching requirement is only 5 percent. The total funding availability is $1,135,000, and U.S. EPA anticipates awarding eight to 27 grants ranging from $40,000 to $250,000. Summaries of P2 and SRA grants awarded, as well as grant results, are available on the U.S. EPA website.

From 2011-2020, U.S. EPA issued 504 grants for a total of $54.1 million. Over one four-year stretch in this time period,[31] U.S. EPA cited these benefits:[32]

- 2 billion dollars saved for businesses.
- 814 million pounds of hazardous materials not used.
- 45.5 billion gallons of water saved.
- 18.6 million metric tons of greenhouse gases not emitted.
- 28.4 billion kilowatt hours of energy saved.

It is not known whether these metrics consider the total impact of the new technologies developed with the assistance of the grant program. For example, replacing perchloroethylene in dry cleaners with professional wet cleaning would decrease the hazardous waste generated but may increase water use.

[31] Calculated with a 4-year rolling period because P2 benefits are re-occurring.
[32] United States, Environmental Protection Agency. "Grant Programs for Pollution Prevention." Website Link. Accessed 16 August 2022.

Another important Pollution Prevention program in the United States is administered by the National Pollution Prevention Roundtable. The roundtable brings together representatives from many public and private agencies in the U.S. and has the following stated goals:[33]

- Exchange information.
- Influence the development of public policy.
- Promote education and awareness about Pollution Prevention programs.
- Foster constructive relationships with other organizations that have related missions.
- Support sustainable funding opportunities for pollution prevention

For the two-year period from 2010-2012, the National Pollution Prevention Roundtable summarized the successes of approximately 90 P2 programs in the U.S:

- $5.4 billion in economic benefits.
- More than 8.9 billion pounds of pollution minimized or eliminated.
- Approximately 8.8 billion gallons of water conserved.
- Energy usage reduced by 1.4 billion kilowatts.
- More than 1.7 billion pounds of greenhouse gases not emitted.

It is likely that some of these reported benefits are duplicates of those reported by U.S. EPA, because U.S. EPA's P2 grants may have funded some of the projects summarized by the National Pollution Prevention Roundtable.

The National Pollution Prevention Roundtable also reported:[34]

- More than 29,999 attendees at P2 training events.
- More than 10,000 site visits.
- More than 240 environmental management systems developed.
- More than 350 P2 related suggestions implemented by more than 3,000 clients.

International pollution prevention efforts include the United Nations Environment Programme (UNEP), which has broad environmental goals. UNEP typically refers to pollution prevention in reference to pollution that directly impacts human health, such as poor air quality and contaminated food and water supplies. This is not the same as the definition in HSC Article 11.9, which focuses on source reduction. However, UNEP is also working on many programs that are aligned with the HSC Article 11.9 definition of pollution prevention.

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[33] National Pollution Prevention Roundtable. "Goals and Objectives." Website Link. Accessed 16 August 2022.

[34] National Pollution Prevention Roundtable. "P2 Results." Website Link. Accessed 16 August 2022.

According to its 2030 agenda, UNEP is determined to protect the planet from degradation, including through sustainable consumption and production. UNEP ties its goals for environmentally sustainable development with other goals, such as the eradication of severe poverty and promoting peace and freedom. Humanitarian goals are tied to environmental goals because unstable societies and societies suffering from extreme poverty are unlikely to achieve sustainable development.[35]

UNEP has published a book – "Green Industrial Policy: Concept, Policies, Country Experiences" – that describes how policies and instruments can support environmentally friendly industries. Available on the UNEP website, the book's primary focus is fighting climate change by improving energy efficiency or changing to renewable energy sources, rather than hazardous waste source reduction. However, there is discussion on promoting a circular economy[36], including reuse or recycling of hazardous materials.

One example of hazardous material reduction cited in the book is China's Yixing Economy and Technological Development Zone. This zone was established in 2006 to support the industrial development of green technologies. This development zone demonstrates how industries can use byproducts from unrelated industries that would otherwise become hazardous waste. For example, the electric industry uses liquid argon that is a byproduct of fertilizer production. Concrete and cement are produced with fly ash and gypsum that are byproducts of local coal burning.[37] The use of fly ash in concrete and cement is similar the DTSC Hazardous Waste Reduction Technology Demonstration Project, which was technologically successful but not cost competitive. The UNEP report does not specify whether the program from the Yixing Economy and Technological Development Zone is cost competitive compared to making concrete and cement without fly ash.[38]

Many other countries have Pollution Prevention programs. Additional research in this area could be conducted, especially in consultation with representatives of these international programs.

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[35] United Nations, United Nations Environmental Program. "Transforming our world: the 2030 Agenda for Sustainable Development." Website Link. Accessed 16 August 2022.
[36] A circular economy is one in which wastes are re-used in the production process to make new goods instead of being disposed of.
[37] It is unknown whether the composition of the fly ash and gypsum used would have been considered hazardous waste in the United States, and therefore if their use in cement would have been considered use constituting disposal.
[38] Green Industrial Policy: Concept, Policy, Country Experiences. PAGE: Partnership for Action on Green Economy, 2017.

6.4 Pollution Prevention Successes and Challenges

Some of the greatest successes of Pollution Prevention programs occur when new technology is combined with new regulations. For example, perchloroethylene (Perc) was once the most common dry-cleaning solvent in the country as well as in California, but as of January 2023, it is no longer legally used in dry cleaning in the state.[39]

Perc presents both acute hazards – such as eye, skin, throat, and respiratory irritation – and chronic hazards – such as liver damage and, potentially, cancer.[40] The solvent poses an especially high risk to those working in the dry-cleaning industry. Perc used in dry cleaning is also identified as a RCRA listed hazardous waste when spent.

Perc is also frequently the cause of contamination in soil, groundwater, and indoor air, requiring dry-cleaning facilities to clean these contaminated media. A survey conducted by the State Coalition for the Remediation of Dry Cleaners estimates that 75 percent of dry-cleaning facilities in the United States have caused contamination. In California, there are approximately 7,500 known dry-cleaning facilities. [41] DTSC is currently evaluating dry-cleaning facilities located in vulnerable communities.[42]

In 2007, the California Air Resources Board (CARB) began a mandatory phaseout of the use of Perc in dry cleaners due to the harmful emissions they generate. That phaseout was due to be complete by 2023, with Perc no longer being used in dry cleaning in California. Dry cleaners have access to many alternative technologies, including professional wet cleaning, liquid carbon dioxide cleaning, or the use of hydrocarbon or silicon-based solvents, some of which have other environmental concerns.[43]

This CARB regulation is mandatory, but other state Pollution Prevention programs are working to achieve the same goal of phasing out Perc use on a voluntary basis. The State of Washington Department of Ecology has a product replacement program in which businesses can apply for up to $40,000 to switch to professional wet cleaning or $10,000 to switch to hydrocarbon cleaning. The program began in 2019 and, as of

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[39] Cal. Code Regs., tit. 17 § 93109(h)(5)

[40] United States, Centers for Disease Control and Prevention, The National Institute for Occupational Safety and Health (NIOSH). "Tetrachloroethylene (Perchloroethylene)." Website Link. Accessed 16 August 2022.

[41] The Cleanup in Vulnerable Communities Initiative includes more than $152 million to fund investigation into potential contamination from California's current or former dry cleaners, many of which are orphan sites Website Link.

[42] California, Department of Toxic Substances Control. "About the Discovery and Enforcement Program." Website Link. Accessed 19 August 2022.

[43] Assessment of Alternatives to Perchloroethylene for the Dry Cleaning Industry. (2023, June). In Toxics Use Reduction Institute Methods and Policy Report No. 27.

2021, 50 of Washington’s approximately 110 Perc dry cleaners had used the program to transition to alternatives.[44] The 45 percent reduction in dry cleaners using Perc is significant, especially in a two-year time frame; however, complete discontinuation of Perc use in Washington may be difficult to achieve on a purely voluntary basis.

The reduced use of Perc in Washington is an example of both the benefits and challenges of voluntary pollution prevention programs. Without the grant incentive to replace old equipment, it is likely fewer businesses would have changed to equipment that produces less hazardous waste. Even with grants, some business owners may not choose to replace their equipment. Reasons may include:

- the business owner not understanding how to apply for the grant or not wanting to expend the effort,
- the grant program covering only part of the cost of the new equipment, and
- The business owner not wanting to assume the risk of changing from current equipment/processes to new equipment/processes.

Voluntary pollution prevention programs appear to have the most success when government agencies collaborate with businesses. According to representatives of pollution prevention programs interviewed by DTSC, some of the best projects have been suggested by businesses. P2 groups also tend to have more success when they focus on efficiency and cost savings rather than on reducing hazardous waste. One example is paint spray efficiency training for auto body shops. Several national P2 programs have had success with them, because improving efficiency by reducing waste saves the shops money without requiring investment in new equipment.

Convincing businesses to voluntarily adopt new technologies remains a significant challenge. Even if a technology is proven to be successful, its benefits will be limited if it is only adopted by a few businesses. While the Washington Department of Ecology product replacement grant allows for businesses to replace old equipment, most grant programs do not. For example, U.S. EPA provides grants to develop new pollution prevention technology or to provide training, but once a technology is developed, it does not typically give grants to businesses for purchasing new equipment to utilize the technology. In some cases, businesses can save money in the long term by adopting pollution prevention technologies, but the time to achieve a return on investment may be too long to justify the equipment purchase. For some smaller hazardous waste generators, the upfront capital costs of new equipment are such a large financial burden that, even if the business owner were interested in waste reduction, purchasing new equipment would be impossible without grant assistance.

[44] Washington, Department of Ecology State of Washington. “Ecology uses cash to convert dry cleaners to less toxic options.” Website Link. Accessed 19 August 2022.

The challenges national Pollution Prevention programs are facing currently also impacted DTSC's P2 program. The efforts of the P2 program were entirely voluntary and DTSC had no regulatory authority to require change and no enforcement capacity. Though the P2 program had many successes, its voluntary nature limited its efficacy in reducing hazardous waste generation.

6.5 Considerations for Recommendations

Examining the past and future goals of pollution prevention is important to identifying considerations for recommended changes to the implementation of HSC Articles 11.8 and 11.9. The goals of DTSC's past Pollution Prevention program were:

- Reducing the generation of hazardous waste.
- Reducing the release into the environment of chemical contaminants that have adverse and serious health or environmental effects.
- Documenting hazardous waste management information and making that information available to state and local governments.

DTSC continues to have similar goals. To better achieve these goals, the following should be considered when developing recommendations for changes to HSC Articles 11.8 and 11.9:

- Past and future source reduction goals.
- Permitting issues surrounding the circular economy and recycling.
- Planning for growing waste streams.
- Future funding of the P2 grant program.
- Analysis of known waste reduction technologies.
- Collaboration with businesses to reduce barriers to P2 implementation.
- Creation of a P2 program under CalEPA.

These items are discussed further in the subsections below.

6.5.1 Past and Future Source Reduction Goals

In 2013, DTSC set a goal of reducing the amount of hazardous waste generated and disposed of in California by 50 percent by 2025.[45] However, attempting a large percentage reduction in the generation of hazardous waste through P2 may not be the most effective way to protect human health and the environment. It may be more feasible to take a targeted and intentional approach.

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[45] California, Department of Toxic Substances Control. "DTSC Issues Draft Decision on Kettleman Facility and Announces Initiative to Reduce Landfill Waste by 50 percent." Website Link. Accessed 19 August 2022.

The single largest category of hazardous waste generated in California by weight is Contaminated Soil from Site Cleanups (State Waste Code 611). As stated in section 2.1.6.1, this category made up one-quarter to one-half of all hazardous waste generated each year from January 2010 through May 2022.

Contaminated soil is also found at sites other than site cleanups. For example, one of the largest projects generating contaminated soil in 2021 was a wastewater treatment plant upgrade in San Francisco. Soil disturbed during the upgrade was determined to be contaminated with contaminants such as lead. The construction activities caused the soil to be excavated, thereby generating a soil that contained hazardous concentrations of contaminants that had to be properly managed.

Despite being the largest category of hazardous waste in California, reducing contaminated soil from site cleanups and construction projects is not a good candidate for Pollution Prevention programs. Contaminated soil is typically a result of poor management of hazardous waste or hazardous materials in the past (e.g., leakage, failure to properly dispose of hazardous wastes, or historical contamination of properties with hazardous constituents). Soils can also become contaminated through aerially deposited lead when vehicles used leaded gasoline or pesticides. Therefore, source reduction is not possible because the soil has already been contaminated. This makes achieving weight-based hazardous waste reduction goals difficult, because contaminated soil makes up the single largest category of hazardous waste by weight. In general, however, cleanup of contaminated sites is beneficial, because it helps minimize the risk of exposure to hazardous chemicals and allows the land to be restored to use. DTSC should not discourage removal of contaminated soil during a site cleanup if it is the best option for site remediation and for returning land to productive use.

The second and third largest categories of hazardous waste by weight, as designated by waste codes on manifests, are Waste Oil (State Waste Code 221) and Other Inorganic Solid Waste (State Waste Code 181). Each of these waste streams has different source reduction considerations. For example, the quantity of used oil generated may decrease in the coming years due to the anticipated increase in the percentage of electric vehicles, but this may also lead to an increase in lithium-ion (Li-Ion) battery waste. Reducing Other Inorganic Solid Waste may also present challenges because this broad category of waste may include wastes from site cleanups, such as concrete, rebar, and other construction debris. Removal of this waste from contaminated sites will be necessary to restore land to productive use, as with contaminated soil removal, but it will not likely contribute significantly to source reduction goals.

Another significant source of waste are metal-bearing sludges. Under federal law, these wastes can be sent for metal recovery without being managed as hazardous wastes, but in California they must go to a permitted TSDF for recovery of those metals.

In contrast to these large categories, some industries generate a small amount of hazardous waste by weight. For example, incinerable waste made up approximately three percent of waste generated since 2010 (Figure 3.1-3). While changes to those industries would not necessarily result in large reductions in the quantity of hazardous waste generated, there can be disproportionate benefits. For example, because there are no commercial hazardous waste incinerators in California, reducing the generation of wastes that require incineration would be beneficial. The California Incinerable Waste Minimization Project showed a 50 percent reduction in incinerable waste generation in participating facilities between 1987 and 1992. If all current incinerable waste generators were to reduce their waste by 50 percent, it would result in a 1.5 percent reduction in California’s overall hazardous waste generation, assuming previous waste totals match future trends. While small, this reduction would make California’s hazardous waste management industry less reliant on out-of-state incineration facilities, which would also reduce the impacts of transporting waste out of state.

6.5.2 Permitting Issues Surrounding the Circular Economy and Recycling

In a traditional linear economy, products are used and become wastes that must be disposed of. In a circular economy, generators re-incorporate what would have been waste back into the production process to become products again. A circular economy minimizes the need for both raw materials and for waste disposal, which is especially important for processes that produce hazardous waste. The differences between a linear economy and a circular economy are shown in Figure 6.5-2.

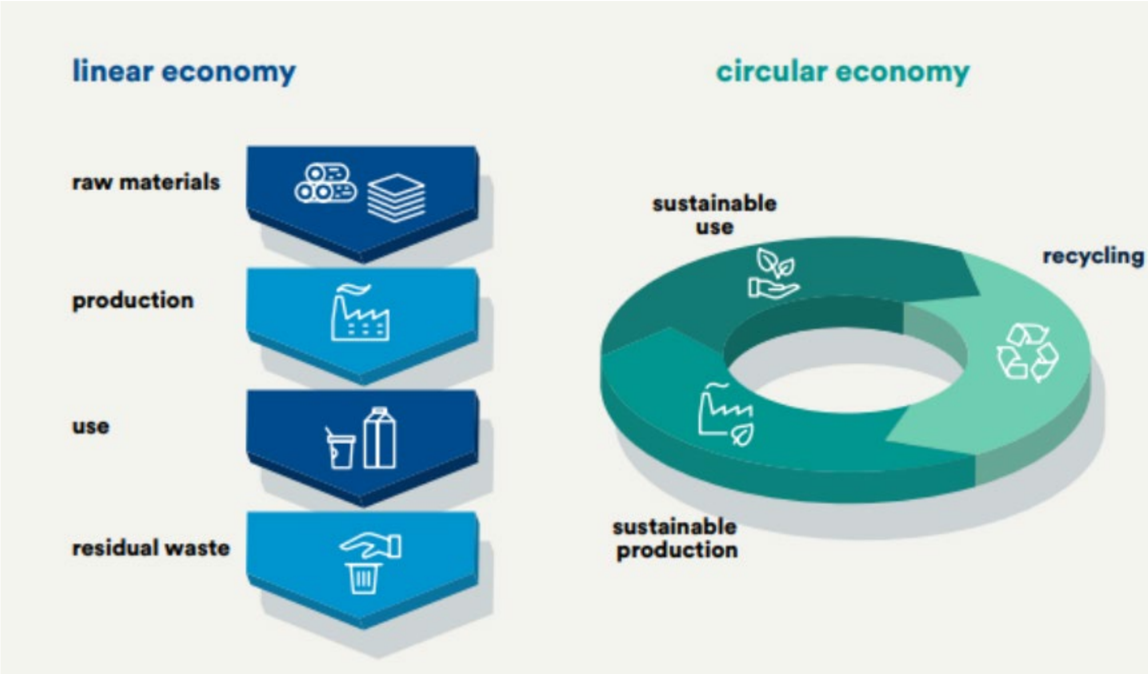

Figure 6.5-2: A model of a Linear Economy Compared to a Circular Economy[46]

The recycling of spent materials into products fosters a circular economy. To aid in pollution prevention, DTSC could support elements of the circular economy to a greater extent. Hazardous waste recycling is an important aspect of hazardous waste management when reducing the amount of hazardous waste generated is not feasible. However, unless there are enough recycling facilities, the economy is inherently linear.

New recycling facilities are needed in California to work toward a circular economy, especially because there are emerging waste streams generating increasing amounts of hazardous waste. For example, Li-Ion batteries are a waste stream that will likely increase in the future as the use of electric cars increases. Recycling Li-Ion batteries would reduce the amount of material sent to landfills. However, the permitting process for new recycling facilities is one of many significant challenges in California. All TSDFs in California must have a permit from DTSC to operate, including some facilities that recycle specific types of hazardous wastes through specific processes, such as smelting to recover metals from Li-Ion batteries. There are currently no voluntary[47] applicants for new hazardous waste permits. Since it was implemented in the 1980's,

[46] What Is Circular Economy, Website Link.
[47] A voluntary applicant is a business that is applying to build a new hazardous waste management facility. This contrasts with applicants that own existing facilities that previously did not require a permit but are now required by DTSC to apply for a permit in order for the business is to remain in operation.

California’s permitting process has discouraged the development of new TSDFs. Many TSDFs currently operating in the state existed before permitting requirements and received authorization through the newly established hazardous waste permitting process. The total number of TSDFs operating in California has declined since permit requirements were introduced.

Generally, time and cost are the primary concerns cited by industry. The time required to process an application for the renewal of an existing hazardous waste facility permit is approximately 2.5 years. It is unknown how long a new permit would take to process, as no new facility applications have been received in California in six years (the last new permit application was received in 2016). The time required is likely discouraging business owners from applying for permits for new facilities. Delays cost applicants’ money. For example, the applicant must own or lease the property at the time the permit application is submitted and, thus, must pay taxes and any other expenses to maintain the property throughout time the permit is being processed, despite receiving no revenue from the facility. Further, the direct cost to applicants for review of a permit application is estimated to be $200,000 to $500,000.

Applicants face other requirements in addition to applying for a new permit, including extensive community notification procedures. The Procedures for the Approval of New Facilities – required by HSC § 25199 (also called the Tanner Act) – require an applicant to notify members of the public in the surrounding area of their intent to build a TSDF. Specifically, notice is to be published in the local newspaper, publicly posted near the project, and mailed to homeowners of contiguous properties. The applicant must also pay the seven members of a local assessment committee that must be created to advise the local government as to what terms and conditions may be acceptable to the local community. These procedures are not required for the creation of a hazardous waste generator. TSDFs must also comply with California Environmental Quality Act (CEQA) requirements.

New requirements have recently been implemented for permitting new hazardous waste management facilities, such as more requirements related to evidence of financial responsibility and assurance, personnel training, consideration of past violations, and completion of a health risk assessment. In accordance with SB 673, additional requirements related to community vulnerability, health risks, and minimum setback distances will also be mandatory in the future. For a business owner, these requirements represent a significant investment in both time and money.

These additional substantial regulatory requirements for new TSDFs make it difficult for a business owner to spend the time and money necessary to obtain approval for a new TSDF and still create an economically viable business. Furthermore, once submitted, approval of a permit application is not guaranteed. If its permit is not approved, the business will lose all the money and time it has spent on the permit application process.

While these requirements for permitted facilities are important to protect health and safety, they will likely continue to result in a reduction of hazardous waste management capacity in California in the future. Specifically, the lack of permitted hazardous waste recycling facilities in California present a challenge for California to manage its waste in-state. Hazardous waste recycling facilities are subject to the same permitting requirements because they often use high heat or chemical treatment and can have potentially harmful emissions if not managed appropriately; at the same time, legitimate recycling is key to a circular economy.

6.5.3 Planning for Future Waste Streams

DTSC's prior P2 program focused on existing industries generating hazardous waste. As such, the program did not, or was not able to, focus on future or anticipated waste streams. New waste streams may have many facets that could be explored for source reduction, recycling, and treatment. In contrast, existing, more developed waste streams may have already implemented relatively easy pollution prevention solutions. New waste streams also offer challenges that could be impediments to pollution prevention, such as rapidly changing technology. Solutions for waste streams like Li-Ion batteries will likely take time but could be an area of future analysis.

6.5.4 Reconsidering Funding of the P2 Grant Program

DTSC previously managed a grant program to encourage the development of new hazardous waste reduction, recycling, and treatment options. This grant program led to the successful demonstration of technologies, but it is no longer funded. As technology continues to evolve, there may be more opportunities for hazardous waste reduction, recycling, and treatment that did not exist at the time of the grant program. This is especially true for new technologies like Li-ion batteries.

DTSC may consider re-establishing a P2 grant program. There are existing successful grant programs at the state level, like the Toxic Use Reduction Institute in Massachusetts, that could serve as models for a future DTSC grant program. The Department may also consider making changes to the original DTSC grant program to better encourage innovation. For example, the original program required the developer of any commercially successful technology to repay the grant and share a percentage of royalties with DTSC. This does not appear consistent with the way many other governmental P2 grant programs are administered, including the U.S. EPA program. Requiring developers of successful new technologies to repay the grants and pay royalties to DTSC may have served as a disincentive for innovation.

Another possible change to the grant program would be to widen the scope beyond technology demonstration. In some cases, technologies already exist to reduce hazardous waste generation, but businesses may lack the capital to implement them. Implementation of a grant program to replace old equipment could result in an immediate reduction of hazardous material use, as it did for the state of Washington's grant to replace dry cleaning machines that use Perc. In contrast, new technology demonstrations will only have an impact on hazardous waste generation if they are both successful and implemented by businesses.

6.5.5 Analysis of Alternative Waste Reduction and Treatment Technologies

DTSC must ensure that alternative hazardous waste reduction technologies and waste treatment technologies are well understood and used appropriately. Treatment technologies and waste reduction technologies have been studied by many industries and for cleanup sites for many years. The Department must consider the applicability and limitations of those technologies before recommending testing for any industry and any cleanup site. Misconceptions and false expectations result from over-promising the potential efficacy of a treatment. Therefore, it is crucial to clearly define the potential tradeoffs involved in any waste reduction and treatment technologies where public funds are proposed to be used to test a technology.

DTSC has a decades-long history of investigating waste reduction and treatment technologies, and many other government agencies have also conducted research and published the findings of their studies. A primary source for research on alternative technologies is U.S. EPA's Clean-Up Information (CLU-IN) website. DTSC should continue to look to these internal and external resources to ensure new or alternative technologies are understood and used appropriately.

Many alternative technologies have been shown to be successful in specific circumstances but are not universally applicable. For example, the Community Protection and Hazardous Waste Reduction Initiative (CPHWRI) performed a bench scale study of soil washing for lead-contaminated soil taken from the area surrounding the former Exide Technologies battery recycling facility. The bench scale study investigated the effectiveness of soil washing for lead removal as an alternative to soil removal and off-site disposal. Soil washing has been shown to effectively remove metals from soil in specific situations and conditions.

Testing results showed that only the gravel portion of the soil was amendable to washing, and the gravel portion only comprised approximately 3 percent of the soil. Furthermore, soil washing was estimated to be at least 77 percent more expensive than removal and off-site disposal.[46] Additional studies could have analyzed various soil

[46] California, Department of Toxic Substances Control, "Community Protection and Hazardous Waste Reduction Initiative." (November 2017).

fractions and types of wash solutions, but there is no guarantee that any combination could have adequately removed the lead from the soil. In addition, the soils' composition and characteristics might vary across any given site laterally or vertically, which could further complicate any treatment approach used on a larger scale operation. Moreover, it is not clear whether the time needed to complete these tests and the increase in costs associated with treating the soil would justify any potential reduction in contaminated soil volume.

The limited funding available to consider alternative types of technologies necessitates the most effective use of that funding. Therefore, DTSC must complete a thorough analysis to ensure that alternative technologies chosen for testing have a defined purpose and have a reasonable expectation of success. These evaluations must be completed on a case-by-case basis so appropriate technologies are chosen.

6.5.6 Collaboration with Businesses to Reduce Barriers to P2 Implementation

Another area of future research could be collaborating with businesses. For this report, the HWPlan Unit interviewed pollution prevention representatives from various state and private entities, including DTSC employees who were in the P2 program when it existed. In addition to interviews, the team also accessed public websites for information. Additional research could be conducted by interviewing hazardous waste generators and CUPAs regarding whether they have instituted any pollution prevention programs.

The California Green Business Network (Network) is an example of the kind of resource DTSC could partner with in assisting businesses with their P2 implementation. A non-profit organization, the Network provides technical assistance to businesses that are struggling to meet environmental goals. It also certifies businesses that comply with environmental regulations – not just for pollution prevention, but also for energy use, water use, and air quality. DTSC's future P2 efforts could utilize the California Green Business Network as an intermediary to help businesses achieve environmental goals.

DTSC could also conduct outreach to universities to determine or assess any research they may be conducting relevant to pollution prevention.

Many hazardous waste streams do not yet have commercially viable alternatives or, as mentioned previously, have alternatives that require capital investment in new equipment. DTSC could consider recommending changes to HSC Articles 11.8 and 11.9 to work with businesses to encourage the reduction of hazardous waste. If the grant program were re-funded, small businesses might be excellent candidates to apply for these grants to improve their own processes.

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Section 7

7. Analysis of the Use of Fees

Federal and state governments use credits, taxes, and fees to help fund services and influence economic activity. Fees have been commonly used as funding mechanisms for portions of hazardous waste management programs. Hazardous waste management fees can help reduce hazardous waste generation and/or help fund transitions between technologies. Nationally, few studies have looked at how hazardous waste fees have impacted waste generation since the 1990s.

A main challenge in this area of economic research has been finding historical data on past fee structures jurisdictions have used. Information included in this Report is limited, and additional research is needed to identify different ways to fund hazardous waste management programs as well as determine how fees can influence the generation of hazardous waste. There are many variables that can influence how a hazardous waste fee structure functions, including hazardous waste type, hazardous waste quantities, and individual state laws. Because of this, it is unclear whether a fee structure in one state would function the same way in another state. The information in this section focuses on the use of fees and the current fee structure in California.

7.1 History and Applications of Fees

Taxes and fees are both important components of waste management, though they serve different purposes. A tax has the primary purpose of raising revenue for state and local governments, whereas a fee recoups the cost of providing a service from someone who uses or benefits from that service.[1]

The use of fees to fund hazardous waste management programs was first proposed in the United States in the 1970s. The primary consideration in developing the first disposal fee was how to fund programs without making the fee so onerous that it led to increased illegal dumping. Another consideration was to create an incentive to reduce the volume of waste generated that required disposal. The philosophy that fees could be a useful tool to influence the behavior of hazardous waste generators gained influence in the 1980s. Later, the issue of whether disposal fees influence where wastes are disposed of – in-state vs out-of-state – became a consideration in structuring the disposal fee.[2]

During the 1980s, the number of legislative bills involving hazardous waste grew rapidly; there were at times more than 60 bills passed in a legislative session. Many of these

[1] Henchman, J. (2013) How Is the Money Used? Federal and State Cases Distinguishing Taxes and Fees, The Tax Foundation, Background Paper No. 63, March 2013 Website Link.

[2] "Report of the Task Force on Fee Reform for the Department of Toxic Substances." California Environmental Protection Agency, 1997 (original document unavailable), excerpt from "Community Protection and Hazardous Waste Reduction Initiative, November 2017. Website Link.

laws provided separate funding mechanisms, some of which were based on the premise that those who benefit from a program or service should pay for it.[3]

Researchers have found it challenging to obtain information regarding the effect that fees have had on hazardous waste generation since these laws were passed. It has been difficult to find systematic data showing what hazardous waste generation fees specific states have imposed over time. Researchers have found some information regarding the impact of taxes on specific hazardous waste streams, but additional research is needed regarding fees.

Fees have also been used to try to influence where wastes are disposed and to prevent or restrict the flow of hazardous waste into different jurisdictions. Two primary federal laws limit the extent to which states are allowed to regulate the movement of hazardous waste across state borders: the Commerce Clause of the U.S. Constitution and the "consistency rules" pursuant to RCRA.

The Commerce Clause states that ''Congress shall have the power . . . to regulate commerce . . . among the several states,'' which has been interpreted to mean that states cannot themselves tax or regulate interstate commerce without prior permission from Congress. [4] The clause was intended to prevent the balkanization of the states by making it illegal for states to erect trade barriers.[5]

The RCRA "consistency rules" require U.S. EPA regulations to be applied consistently nationwide. Specifically, they allow U.S. EPA to refuse a state RCRA authorization if the state engages in any of the following:

- Unreasonably restricts, impedes, or bans free movement of waste across state borders to authorized treatment, storage, or disposal facilities.
- Prohibits the treatment, storage, or disposal of hazardous waste, unless the prohibition is necessary to protect health or the environment.
- Fails to comply with the federal mandated "manifest" system for tracking the movement of hazardous waste.[6]

[3] "Report of the Task Force on Fee Reform for the Department of Toxic Substances." California Environmental Protection Agency, 1997 from "Community Protection and Hazardous Waste Reduction Initiative, November 2017. Website Link.
[4] Levinson, A (1999), "NIMBY taxes matter: the case of state hazardous waste disposal taxes," Journal of Public Economics 74, 31–51
[5] California Department of Health Services, California's Exports and Imports of Hazardous Waste 1986 – 1988, July 1990
[6] California Department of Health Services, California's Exports and Imports of Hazardous Waste 1986 – 1988, July 1990

7.2 Fee Types

There are many variations in fee structures depending upon the specific goals of the fee. The following discussion focuses on two basic types of fees commonly used in hazardous waste management: the flat rate fee and the tiered rate fee.

States use hazardous waste fees to create an economic incentive for minimizing waste. A common consideration is whether a fee is front-end loaded or waste-end loaded. Front-end fees can be imposed at or near the beginning of the commercial chain of production of selected chemicals and substances, throughout the distribution network, and/or when it is used. Waste-end fees can be levied on the generation, transportation, storage, treatment, and/or disposal of wastes.[7]

7.2.1 Flat Rate Fees

One common type of fee applied to hazardous waste is the flat rate fee. A flat rate fee applies a fixed cost per unit. A fee may be imposed onthe quantity of waste generated (e.g., large quantity generators and small quantity generators), land disposed, and off-site transportation.[8]

One example of a flat rate fee in California is the new Hazardous Waste Generation and Handling Fee.[9] California began this per-ton generation fee in 2022, which set the current Generation and Handling Fee at $49.25 per ton.[10] This recent change in fee structure provides an opportunity to study the effect of the fee change on waste generation in the state.

Additional research is needed to determine in what circumstances flat rate fees can be most effectively used to influence the amount of hazardous waste generated in California. Some considerations should be made for specific waste streams, waste volumes, and how the reduction of hazardous waste will impact the revenue generated by the fees and the program or programs the fees fund.

7.2.2 Tiered Fees

Another common type of fee applied to hazardous waste is the tiered rate fee. A tiered rate fee scales fees based on the quantity of hazardous waste being managed (e.g., generated, transported, or disposed of). In other words, fees can either increase or decrease depending on the amount of hazardous waste managed.

An example of a tiered structure is found in the state of Oregon. Its special hazardous waste management fee is $20 per ton up to 2,500 tons, $10 per ton between 2,500 and

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[7] CA Capacity Assurance Plan for Hazardous Waste Management-definitions, Economic Incentives, Taxes/Fees. October 17, 1989

[8] Missouri Department of Natural Resources: Hazardous Waste Fees, Website Link.

[9] California Department of Toxic Substances Control (DTSC): Fee Structure, Website Link.

[10] California Department of Tax and Fee Administration (CDFTA): Hazardous Waste Generator and Handling Fee, Website Link.

12,500 tons, $5 per ton between 12,500 and 25,000 tons, and $2.50 per ton over 25,000 tons.[11]

A tiered approach can run counter to the polluter pays principle – the commonly accepted practice that those who produce pollution should bear the costs of managing it in order to prevent damage to human health or the environment[12] – as the largest hazardous waste generators pay less money per ton generated.

California applied a tiered fee structure to hazardous waste generation in the early to mid-1990's. The state discontinued this practice on January 1, 2022, when the Generation and Handling Fee replaced the tiered Generator Fee.

Additional research is needed to determine in what circumstances tiered rate fees can be most effectively used to influence the amount of hazardous waste generated. Some considerations should be made for specific waste streams, waste volumes, and how the reduction of hazardous waste will impact the revenue generated by the fees and the program or programs the fees fund.

7.3 Changes in California's Fee Structure

California made changes to its hazardous waste management fee structure in 2022, after the passage of Senate Bill 158. The intent of this fee reform was to establish a sustainable level of funding to enable DTSC to enforce hazardous waste laws , investigate and remediate contaminated sites, protect public health and the environment from toxic products, and respond to legislative mandates enacted through the budget process. Reform streamlined DTSC's complex fee system and revised the payment schedule to align payments with assessed fee rates on the fiscal calendar. The new fee structure eliminated several exemptions in order to support a more equitable and sustainable fee framework that supports the polluter pays principle. Reform ensured generators support DTSC's regulatory and clean-up activities by equitably distributing the cost of managing hazardous waste.

DTSC revised the Hazardous Waste Facility Fee[14] to change from a calendar year schedule to a fiscal year schedule. As a result, these additional changes take effect July 1, 2023:

- All fee exemptions will be eliminated.

[11] Oregon State, Hazardous Waste and Hazardous Materials, ORS 465.376, Special hazardous waste management fees, Website Link.
[12] (LSE, 2022, What is the Polluter Pays Principle?) The London School of Economics and Political Science. Grantham Research Institute on Climate Change and the Environment, Website Link.
[14] California Department of Tax and Fee Administration: Hazardous Waste Facility Fee, Website Link.

- The base rate will be set at $94,910 (previously $35,943), a rate that reflects a DTSC level of service that is responsible for covering costs, including the expected amount of money needed to regulate a permitted facility.[16]

Changes in California's hazardous waste generation fee structure now include a flat rate fee for hazardous waste generation.. . The new Hazardous Waste Generation and Handling Fee,[17] per California HSC § 25205.5.1, also:

- Replaces the Generator, Disposal, Manifest, and EPA ID fees.
- Retains fee exemption for small quantity generators (less than 5 tons per year).
- Eliminates exemption for used oil.
- Modifies fee rate and structure.
- Changes from tiered rate structure to per ton charge.
- Assesses fee on hazardous wastes generated in previous calendar year.

California's Environmental Fee[18] now includes the following:

- Exemption for small businesses (those with fewer than 100 employees)
- No rate increases for businesses with 100 – 500 employees.
- Rate increases on businesses with more than 500 employees.

The impacts of this restructuring on waste generation and other waste management decision-making will not be known for several years as hazardous waste generators and facilities adjust operations.

7.4 Research Opportunities

Implementation of the new fee structure may change behavior related to the generation and management of hazardous waste creates an opportunity for additional research. DTSC is monitoring revenues from the new fee structure to better understand what may incentivize hazardous waste generators.

[16] DTSC's Annual Fee Summary: Website Link.
[17] California Department of Tax and Fee Administration: Hazardous Waste Generation and Handling Fee, Website Link.
[18] California Department of Tax and Fee Administration: Environmental Fee, Website Link.

Generally, future fee structure research may include, but not be limited to, the following:

- The benefits of applying the “polluter pays” principle to fee structures.
- Disincentivizing hazardous waste generation.
- Reflecting both the broad societal responsibility for legacy pollution and the broad benefit of reduced harm from chemical exposure.
- Supporting California’s climate, equity, and circular economy goals.

One significant challenge will be to determine a method of measuring whether a reduction in waste generation is related to a change in the fee structure or some other factor.

In addition, SB 158’s fee reform requirements do not consider several key factors related to waste streams – the composition or characteristics of the waste stream, the relative hazard posed by each waste stream, the entity generating the waste, or the reason(s) the waste is generated. This means, for example, that non-RCRA soil contaminated with naturally occurring heavy metals during an infrastructure project is charged the same fee rate as potentially more hazardous RCRA waste containing metals from a metal plating facility .

The broader spectrum of hazardous waste captured under California’s hazardous waste program relative to the federal program means that there are significant variations in the relative hazard of the various waste streams. Future research may include assessing different fees on different types of hazardous waste, for example, RCRA wastes vs. non-RCRA wastes.

Future research into how different fee structures may influence waste management should also incorporate information from this Report, such as current and future waste streams, hazardous waste facility siting issues, and what is needed to support a circular economy in California.

7.5 Discussion

Taxes and fees are both important components of waste management and have been used as funding mechanisms for portions of hazardous waste management programs. Hazardous waste management fees might help reduce hazardous waste generation and/or help fund transitions to new technologies. California’s new fee structure uses a flat rate, per-ton generation and handling fee assessed on hazardous wastes generated in the previous calendar year. The new fee structure is intended to ensure hazardous waste generators, or “polluters,” contribute equitably and was intended to influence the reduction of their hazardous waste generation.[19] It may take years to see any impacts of these changes. Further, it may be appropriate in the future to give additional

[19] California Department of Toxic Substances Control (DTSC): Fee Structure, Website Link

consideration to the composition or characteristics of waste streams, the relative hazard posed by each waste stream, the entity generating the waste, and/or reason the waste is generated.

Revenue received from generators through the Hazardous Waste Generation and Handling Fee provides funding to DTSC's current Hazardous Waste Management Program (HWMP); however, HWMP's budget does not include funds for a waste reduction program. Furthermore, if a waste reduction program is created and its funding is attached to the fee, its funding will decrease as hazardous waste generation decreases.

Another significant issue to consider is how Hazardous Waste Generation and Handling Fees are collected and how often generators are audited. A generator records on the hazardous waste manifest the quantity of hazardous waste it generates and uploads information from the manifest to DTSC's Hazardous Waste Tracking System (HWTS). However, the fee amount is not determined based on the quantity reported in HWTS rather it's based on the quantity of waste a generator reports to the California Department of Tax and Fee Administration (CDTFA). Generator fee collection is administered by CDTFA, not DTSC and CDTFA also has enforcement authority. In a process separate from DTSC's, hazardous waste generators report the quantity of waste generated to CDTFA. CDTFA conducts audits on a small percentage of the reported generators to determine whether they are reporting the same number to DTSC's HWTS and to CDTFA. This introduces a potential for misreporting and errors in the amount of fees actually collected compared to what should be collected. DTSC and its HWMP funding come from the Generation and Handling Fee, so reductions in fees and errors in collection reduce funding to the program.

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Section 8

8. Analysis of Hazardous Waste Criteria

A key element in DTSC's Hazardous Waste Management Program (HWMP) is the identification of hazardous wastes. It is important to accurately identify those wastes so that they are handled in a manner that protects human health and the environment.

California Health and Safety Code (HSC) section (§) 25135(b)(5) requires that DTSC analyze the criteria used to identify wastes as hazardous waste under state law. As such, DTSC will conduct an analysis of the following three components specified in HSC § 25135(b)(5) pertaining to current hazardous waste identification criteria:

1. An assessment of the extent to which the criteria that result in wastes being regulated as hazardous waste in California, as opposed to under the federal act, provide additional safeguards that are necessary to protect public health and the environment in the state.

2. An assessment of the existing hazardous waste identification criteria and the extent to which they reflect current science, technology, or analytical methods.

3. An assessment of additional contaminants, chemical constituents, or hazard characteristics or traits that are not currently included in the hazardous waste identification criteria, and the additional public health or environmental protections that could be achieved if they were to be added to the identification criteria.

The information included in this section describes the approach that will be used to assess the three components listed above.

8.1 Defining Hazardous Waste Identification Criteria

Under Subtitle C of the Resource Conservation and Recovery Act (RCRA), the United States Environmental Protection Agency (U.S. EPA) defines hazardous waste using two processes: by listing certain wastes as hazardous (i.e., waste from certain industrial processes or sources), and by identifying characteristics (i.e., physical or chemical properties) that make a waste hazardous. These wastes are termed "listed hazardous wastes" and "characteristic hazardous wastes".[1]

California's hazardous waste criteria were in place before U.S. EPA established the federal system for identifying hazardous waste. When California was in the process of

[1] 45 FR 33085 (May 19, 1980)

obtaining authorization from U.S. EPA to implement the federal program, the state maintained its pre-existing hazardous waste criteria while also adopting the federal criteria. California's hazardous waste criteria are "more stringent and broader in scope" than the federal criteria.

The federal hazardous waste criteria have been adopted into California's regulations. Federal waste classification regulations are found in Title 40, Code of Federal Regulations, (40 CFR). California's hazardous waste classification laws are outlined in HSC Division 20, Chapter 6.5. Regulations adopted to implement the HSC are found in California Code of Regulations (Cal. Code Regs.), division 4.5, title 22 (tit. 22).

Some of the primary differences between the federal program and California's program include:

- Hazardous waste criteria.
- Hazardous wastes that are excluded from statute and regulation.
- Hazardous wastes that are exempt from statute and regulation.

California identifies more waste as hazardous than U.S. EPA because California's hazardous waste program is broader and more stringent than the federal program. Further, the federal program includes certain exclusions and exemptions that California has chosen not to adopt.

These differences drive which wastes are identified as hazardous and how those wastes are required to be managed in California. The following information provides a summary of the current hazardous waste identification criteria in California.

8.1.1 Listed Waste

Listed hazardous wastes are included in Cal. Code Regs. Tit. 22, chapter 11, Article 4, and Article 4.1. Those listed in Article 4 are RCRA listed and the mercury listings in Article 4.1 are those that California has listed. Both EPA and California made these lists of specific waste streams or chemicals that were known from experience to present a threat to human health or the environment when disposed of. Examples of listed waste types include wastes from various industrial processes, wastes from specific sectors of industry, or wastes in the form of specific chemicals.

U.S. EPA “listed” certain wastes because they were found to pose a substantial present or potential threat to human health and the environment.[2] If a waste poses enough of a hazard, U.S. EPA includes a precise description of that waste in one of the four lists of hazardous waste in the federal regulations. U.S. EPA will “list” a waste as hazardous if the waste exhibits one of the four characteristics of hazardous wastes (ignitability, corrosivity, reactivity, or toxicity); be acutely hazardous (fatal to human or animals at low doses); or contain constituents that are capable of posing a “substantial present or potential hazard to human health or the environment when improperly treated, stored, transported or disposed of.” Typically, generators can determine whether their waste is considered listed based on how the waste was generated. While laboratory analysis is sometimes needed, analytical testing alone will not produce enough information to conclusively determine whether the waste is “listed”.

California recognizes five hazardous waste lists (four U.S. EPA lists and one California-only list):

- **F – Code Wastes** (F001-F039): Hazardous waste from non-specific sources (e.g., spent solvents)[3]
- **K – Code Wastes** (K001-K148): Hazardous waste from specific sources (e.g., wastewater sludge from the production of creosote)[4]
- **P – Code wastes** (P001-P205): Acutely hazardous commercial chemical products and off- specification species, container, and spill residues (e.g., pesticides)[5]
- **U – Code wastes** (U001-U248): Discarded commercial chemical products and off-specification species, container, and spill residues (e.g., acetone)[6]
- **M – Code Wastes** (California M001-M004): Discarded mercury-containing products[7]

[2] U.S. EPA. Introduction to Hazardous Waste Identification (40 CFR Parts 261). Solid Waste and Emergency Response (5305W) EPA530-K-05-012. Available at: Website Link

[3] Cal. Code Regs. tit. 22, § 66261.31. Hazardous Wastes from Non-Specific Sources. Available at: Website Link

[4] Cal. Code Regs. tit. 22, § 66261.32. Hazardous Wastes from Specific Sources. NOTE: Available at: Website Link

[5] Cal. Code Regs. tit. 22, § 66261.33. Discarded Commercial Chemical Products, Off-Specification Species, Container Residues, and Spill Residues Thereof. Available at: Website Link

[6] Cal. Code Regs. tit. 22, § 66261.33. Discarded Commercial Chemical Products, Off-Specification Species, Container Residues, and Spill Residues Thereof. Available at: Website Link

[7] Cal. Code Regs. tit. 22, § 66261.50. Mercury-Containing Products That Are Hazardous Wastes When Discarded. Available at: Website Link

The F, K, P, and U lists are federal RCRA lists. California has created the M list for certain types of mercury-containing wastes.[8]

8.1.2 Characteristic Waste

Characteristic hazardous wastes are wastes that exhibit any one of four characteristics: ignitability, corrosivity, reactivity, and toxicity. A determination can be made if a waste exhibits a characteristic by analyzing a sample of the waste or using knowledge of the waste properties. The regulations explaining these characteristics and the test methods to be used in detecting their presence are found in federal regulations at 40 CFR Part 261[9] and California regulations (Cal. Code Regs, tit. 22, chapter 11, Article 3, and relevant appendices).[10]

As a RCRA authorized state, and as noted above, California can impose criteria for identifying hazardous waste characteristics that are both broader in scope and more stringent than RCRA criteria. The federal and state criteria for the characteristics of ignitability and reactivity are almost identical.[11] California's criteria for the corrosivity characteristic are slightly broader in scope than the federal criteria, and California's criteria for the characteristic of toxicity are both more stringent and broader in scope than the federal criteria. These significant differences have led to much more waste being identified as hazardous in California than in the federal hazardous waste program.

Some of the primary differences in the criteria for hazardous waste characteristics include:

- Federal criteria for the characteristic of corrosivity covers only corrosive liquid wastes, whereas California criteria includes both corrosive liquids and solid wastes.

- The federal Toxicity Characteristic Leaching Procedure (TCLP) is a leachability test used to identify wastes that meet the federal criteria for the characteristic of toxicity. California uses both the TCLP and its own leachability test, the Waste Extraction Test (WET), to identify whether certain organic and inorganic wastes are toxic. The TCLP and WET methods both use laboratory simulations to reflect how chemicals may behave in a landfill setting but the WET method is

[8] California adopted a hazardous waste listing in 2003, separate from the RCRA listed hazardous waste, and identified it as California M-Listed Waste.
[9] A waste that is identified as a hazardous waste pursuant to one or more of the characteristics set forth in federal regulatory sections (40 CFR § 261.21 through § 261.24)
[10] A waste that is identified as a hazardous waste pursuant to one or more of the characteristics set forth in state of California regulations (Cal. Code Regs., tit.22, § 66261.21 to § 66261.24) and relevant appendices.
[11] There are currently some differences in the laboratory methods. See Appendix D for additional information.

considered more stringent than the TCLP. For example, the WET includes a longer extraction time (48 hours for the WET vs. 18 hours for the TCLP) and uses a more aggressive acid extractant (citric acid for the WET and acetic acid for the TCLP).

- The federal TCLP identifies eight metals and 32 organic compounds. California includes those TCLP constituents and uses the WET to identify an additional 12 inorganic constituents and 18 organic compounds. For example, California regulates nine metals as potentially toxic – antimony, beryllium, cobalt, copper, molybdenum, nickel, thallium, vanadium, and zinc.
- U.S. EPA does not regulate wastes based on the total concentration of toxic constituents in the waste, but California does. The Department established Total Threshold Limit Concentration (TTLC) values to consider the potential impact that might result from improper disposal of particulate toxic wastes.[12]
- U.S. EPA only has one element to its toxicity characteristic – the TCLP – whereas California has an additional eight. California's toxicity criteria include two leaching tests (TCLP and WET); total digestion test; acute dermal, acute oral, acute inhalation; acute aquatic bioassay test, a list of carcinogens; and department-imposed criterion. A waste is considered toxic if it meets any one of these toxicity criteria.

One result of the additional toxicity criteria is that certain wastes are identified as hazardous that one would not ordinarily perceive to be "hazardous." For instance, products like soaps, lotions, and shampoos, commonly require management as hazardous waste in California because many fail the aquatic bioassay test.[13] A 2017 Retail Waste Working Group report, indicated that about 30% of hazardous waste generated in California is non-RCRA hazardous waste that could fail the Aquatic Toxicity Test. [14] This highlights the importance of reviewing the Aquatic Toxicity Test to determine if the test effectively identifies hazardous waste streams. As part of the reconsideration of hazardous waste classification, DTSC plans to review

[12] Department of Toxic Substances Control-Final Statement of Reasons (FSOR) for Proposed Regulations, "Criteria for Identification of Hazardous and Extremely Hazardous Wastes," pg. 98, 1984. R-45-78

[13] Some specific products that have been identified as hazardous waste include, include but are not limited to, the following: Nature's Way Ginger supplement, Palmolive Ultra PureUltra-Pure and Clear, Lysol Toilet Bowl Cleaner, Dr. Bonners Magic Soaps Peppermint Pure Castile Soap, Aveeno Baby Wash and Shampoo, and Banana Boat Sport Sunscreen. Retail Waste Working Group (RWWG). 2017. Surplus Household Consumer Products and Wastes Report to the Legislature. Available at: Website Link

[14] Retail Waste Working Group (RWWG). 2017. Surplus Household Consumer Products and Wastes Report to the Legislature. Available at: Website Link

whether these wastes can safely be managed by alternative methods rather than disposing of these wastes into hazardous waste landfills.

Another example is the additional nine metals regulated by California that are not regulated federally. The underlying research that provides basis for the rationale to regulate these metals is from the 1950's, 1960's, 1970's, and 1980's and will be reviewed to determine if more recent information is available. The toxicity criteria for selecting these metals along with a summarized rationale to regulate them are shown in Table 8.1.2-1.

Table 8.1.2-1 Rationale for Toxicity Characteristics of Additional Metals in California[15]

Contaminant	Toxicity	Summary of Rationale
Antimony	• Oral Toxicity (LD_{50}) • Inhalation Toxicity (LC_{50}) • Aquatic Bioassay (96-hour LC_{50})	Inhalation of antimony has been shown in industrial settings to lead to respiratory tract irritation and long-term lung diseases in humans. Ingestion of antimony can cause significant illness and death in humans and other animals. Antimony has also been shown to be lethal to fish and concentrates in some forms of marine life.
Beryllium	• Inhalation Toxicity (LC_{50}) • Aquatic Toxicity (96-hour LC_{50})	Inhalation of beryllium has been shown to cause lung diseases and an increased risk of lung cancer. Additionally, it is lethal to fish and concentrates in marine life.
Cobalt	• Oral Toxicity (LD50) • Aquatic Toxicity (96-hour LC_{50})	Ingestion of cobalt has been shown to impact growth, appetite, and cause death in some animals. Cobalt has been shown to cause death in some marine organisms including some fish.
Copper	• Oral Toxicity (LD50) • Aquatic Toxicity (96-hour LC_{50})	Ingestion of copper has been shown to cause illness and impact reproduction in some animals. In addition, copper has been shown to be lethal to fish.
Molybdenum	• Oral Toxicity (LD50) • Aquatic Toxicity (96-hour LC_{50})	Ingestion of molybdenum has been shown to lead to impacts such as reduced rate of growth in some animals. Additionally, molybdenum is considered less toxic than many toxic metals but has been shown to have some toxicity to aquatic life.

[15] Department of Toxic Substances Control-Final Statement of Reasons (FSOR) for Proposed Regulations, "Criteria for Identification of Hazardous and Extremely Hazardous Wastes," Section D – Inorganic Persistent and Bioaccumulative Substances, R-45-78

Contaminant	Toxicity	Summary of Rationale
Nickel	• Inhalation Toxicity (LC50) • Aquatic Toxicity (96-hour LC_{50})	Inhalation of nickel has been shown to lead to illness in humans such as sinus inflammation, ulcers, lung irritation, emphysema, and respiratory cancer. Nickel has also been shown to be lethal to some fish.
Thallium	• Oral Toxicity (LD_{50}) • Inhalation (LC_{50}) • Aquatic Bioassay (96-hour LC_{50})	Ingestion of thallium has been shown to be extremely fatal to humans and animals. Inhalation has also occurred in industrial settings that has led to illness or poisoning. In addition, thallium has been reported to be toxic to some fish.
Vanadium	• Oral (LD_{50}) • Inhalation (LC_{50}) • Aquatic Bioassay (96-hour LC_{50})	Ingestion of vanadium has been shown to depress growth other health impacts to some animals. Ingestion or inhalation of airborne vanadium in industrial settings has been shown to cause illness in humans. Moreover, vanadium has been shown to be toxic to some marine life.
Zinc	• Aquatic Bioassay (96-hour LC_{50})	Zinc has been shown to be toxic to fish in certain conditions.

One of the predominant reasons the Department identified these nine metals as hazardous was due to their aquatic toxicity. For example, zinc is one of the metals that DTSC regulates solely due to aquatic toxicity.

Some of the nine metals identified above occur naturally in soil. When projects are undertaken that require soils be excavated, for example, to build bridges, lay electrical lines, or to build an underground garage, if the soils contain metals that exceed DTSC's regulatory thresholds, they may be required to be managed as hazardous waste.

8.1.3 Exclusions and Exemptions

Generally, a hazardous waste exclusion means a material either is not a waste, or is a waste that is not a hazardous waste, depending on the type of exclusion. A waste could also be excluded from classification as a waste if it is recycled in a particular manner. A waste that is excluded from classification may still be subject to certain regulatory requirements. U.S. EPA identifies 44 exclusions but California only adopted eight exclusions into its regulations. For example, U.S. EPA conditionally excludes as solid and hazardous wastes hazardous secondary materials used to make zinc fertilizers.

California did not adopt this exclusion and would therefore regulate these wastes as non-RCRA wastes.

Wastes that are exempted typically means that the waste is identified as a hazardous waste but is exempt from certain regulatory requirements.

DTSC should review U.S. EPA's exclusions and exemptions to determine which ones might be adopted to foster additional recycling in California.

8.2 Hazardous Waste Criteria Evaluation Process

Assessing California's hazardous waste criteria demands thorough review and in-depth research of rulemaking packages, current scientific literature, reports and databases. As such, this effort will utilize multiple programs internal to DTSC, internal to CalEPA, and external to state agencies. These programs may include, but not be limited to, the following:

- DTSC Hazardous Waste Management Plan Unit (HWPlan Unit)
- DTSC Waste Evaluation and Recycling Unit (WERU)
- DTSC Environmental Chemistry Lab (ECL)
- DTSC Human and Ecological Risk Office (HERO)
- DTSC Safer Consumer Products (SCP)
- Department of Pesticide Regulation (DPR)
- Office of Environmental Health Hazard Assessment (OEHHA)
- State Water Resources Control Board
- Department of Resources Recycling and Recovery (CalRecycle)

The Waste Evaluation and Recycling Unit (WERU), within the HWMP Office of Policy , will lead the evaluation of each potential change in criteria and will coordinate with other groups as needed.[16] WERU will also provide scientific technical analysis; review of historical legislation, statutes, and regulations; and hazardous waste criteria expertise. The HWPlan Unit will provide additional scientific and engineering technical analysis, historical regulatory review, and coordination with the Board of Environmental Safety.

The first step in the analysis of hazardous waste criteria is to compare federal and state criteria. This comparison will feed information into the three components DTSC is analyzing under HSC §25135(b)(5):

[16] Beginning in FY2022-23, DTSC was funded to reestablish a Waste Classification Unit to evaluate the existing California hazardous waste criteria, recommend modifications to those criteria, assist in the adoption of any approved recommendations, and provide waste classification determination and recycling exclusion interpretations and technical support.

1. The extent to which California’s additional criteria provide additional safeguards necessary to protect public health and the environment.
2. The extent to which existing criteria reflect current science, technology, or analytical methods.
3. An assessment of the additional public health or environmental protections that could be achieved by including additional contaminants, chemical constituents, or hazard characteristics or traits in California's hazardous waste identification criteria.

The most significant differences between the federal and state criteria relate to the characteristics of hazardous waste and differences between federal and state exclusions and exemptions. As such, the comparison of federal and state hazardous waste criteria will be conducted in the following order of priority:

1. Comparison of federal and state characteristic criteria
2. Comparison of federal and state exemptions and exclusions

Identifying these differences between federal and state criteria provides initial information for two of the three components DTSC is analyzing under HSC §25135(b)(5) (detailed below in 8.3.1, 8.3.2, and 8.3.3), and may help inform analysis of the third component. Therefore, a starting point in the analysis was to compare the federal hazardous waste characteristic criteria found in 40 CFR part 261, subpart C, with the state hazardous waste characteristic criteria found in Cal. Code Regs., tit. 22, ch.11, article 3. Summary tables and descriptions of the differences for each characteristic – ignitability, corrosivity, reactivity, and toxicity – are included in Appendix D of this section.

A description of the approach taken in analyzing each of the three components is described in detail in Section 8.3.

8.3 Component Analysis:

California Health and Safety Code (HSC) §25135(b)(5) identifies three main components for analysis of hazardous waste criteria. Therefore, strategies were developed to analyze each component. An overview of the approach for each component is described below.

8.3.1 Component HSC §25135(b)(5)(B):

An assessment of the extent to which the criteria that result in wastes being regulated as hazardous waste in California, as opposed to under the federal act, *provide additional safeguards that are necessary to protect public health and the environment in the state.*

In order to assess the extent to which California's hazardous waste criteria cause wastes to be regulated as hazardous as opposed to under the federal act, the state and federal criteria must be compared. This comparison is included in Appendix D.

When the differences are identified, a determination is made as to how California's criteria provide additional safeguards necessary to protect public health and the environment. To do this, DTSC will research the historical statutory and regulatory basis for hazardous waste criteria. The HWMP team will review federal and state rulemaking decision documents, such as Federal Registers, Initial Statement of Reasons (ISOR), Final Statement of Reasons (FSOR), and other relevant documents.

Once the historical and/or technical reasons for the differences are analyzed, the additional safeguards intended to be provided by the California criteria can be identified and evaluated to determine whether any changes should be made.

8.3.2 Component HSC §25135(b)(5)(C):

An assessment of the existing hazardous waste identification criteria and the extent to which they reflect current science, technology, or analytical methods.

To determine whether existing hazardous waste identification criteria reflect current science, technology, or analytical methods, DTSC will review laboratory testing methods and if the past rationale for the current criteria reflect current science and technology.

Initial research into analytical methods indicate that U.S. EPA has adopted, modified, or discontinued numerous laboratory methods for hazardous waste testing since the beginning of the RCRA program; however, DTSC conducted its last comprehensive analytical method update in 1996. [17] [18] While some individual analytical methods (e.g., pH and flashpoint) have been modified as recently as 2004,[19] DTSC has not updated all of its laboratory methods to be consistent with federal methods. This indicates that some laboratory methods may not reflect current science or analytical methods. Additional work in this area will be necessary to determine which laboratory methodologies are out of date, and recommendations will be made to adopt the federal methods where appropriate.

There are three laboratory tests available to determine whether a waste displays the toxicity characteristic for both its inorganic and organic components. These tests include

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[17] U.S. EPA Status Tables for SW-846, Third Addition, Revised May 2020
[18] Cal. Code Regs. tit. 22, § 66260.11 (a)(33)
[19] Cal. Code Regs. tit. 22, § 66260.11 (a)(51-61)

the TCLP, the WET, and a total nitric acid digestion test that can be performed to determine the total concentration of a particular constituent in the waste. For a given waste, the results of these tests are compared to their respective regulatory thresholds, the TCLP levels, the STLCs, and TTLCs.

The federal TCLP was designed to model a theoretical mismanagement scenario in which a waste is placed in an unlined landfill that contains municipal solid waste. An acetic acid solution was selected for use as the extractant fluid because it is a common organic acid observed in landfills.[20] U.S. EPA set numerical limits for this test method that would ensure the groundwater under a landfill does not pose a threat to human health and the environment. Similarly, California's WET was designed to show, through laboratory simulations, how hazardous constituents could potentially mobilize in a landfill setting. Citric acid was selected for use.[21].

California established the associated STLC limits based on the potential for soluble substances from improperly disposed wastes to migrate via surface or groundwater to sensitive aquifer systems such as drinking water supplies or aquatic wildlife environments. Additionally, since the STLCs were established to protect water supplies, it was determined appropriate to use drinking water standards to set the regulatory limits.

The STLC values were primarily determined by multiplying drinking water standards by an attenuation factor of 100.[22] The rationale was that, if a waste has the ability to generate a leachate that contains a substance at a concentration greater than 100 times its drinking water standard, and if the substance is diluted by no more than 100 times before contaminating a drinking water supply, the drinking water would surpass the drinking water standards. Thus, if the soluble concentration of a constituent exceeded a certain regulatory limit (STLC) the waste could pose a potential hazard if not disposed in a secure landfill.[20]

The term "secure landfill" is not defined in current statute or regulations or in the FSOR. A discussion of the implications of this lack of a definition follows in 8.4.

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[20] Department of Toxic Substances Control-Final Statement of Reasons (FSOR) for Proposed Regulations, "Criteria for Identification of Hazardous and Extremely Hazardous Wastes," pg. 114, 1978. R-45-78

[21] Department of Toxic Substances Control-Final Statement of Reasons (FSOR) for Proposed Regulations, "Criteria for Identification of Hazardous and Extremely Hazardous Wastes," pg. 118, 1978. R-45-78

[22] Department of Toxic Substances Control-Final Statement of Reasons (FSOR) for Proposed Regulations, "Criteria for Identification of Hazardous and Extremely Hazardous Wastes," pg. 89-90, 1978. R-45-78

8.3.3 Component HSC §25135(b)(5)(C):

An assessment of additional contaminants, chemical constituents, or hazard characteristics or traits that are not currently included in the hazardous waste identification criteria, and the additional public health or environmental protections that could be achieved if they were to be added to the identification criteria.

The assessment of this component is intended to better understand the nature of Contaminants of Emerging Concern (CECs) and their characteristics or traits that when identified in wastes, may pose risks to human health and the environment. This assessment will include consultation with other groups, such as those identified in Section 8.2. These groups have expertise regarding emerging chemical constituents that may need to be evaluated in the future. Internal and external collaboration will assist DTSC in identifying needed changes based on CECs. Further discussion regarding CECs is included in Appendix E.

8.4 Next Steps:

DTSC’s WERU and HWPlan unit have begun consulting with the department’s Environmental Chemistry Laboratory to determine an appropriate strategy for updating test methods where necessary. Based on preliminary research to date, the following aspects of hazardous waste identification criteria should be considered for review:

- Numerous assumptions used to set the TTLCs and STLCs were based on historical management of wastes and identification of damage incidents related to waste management before hazardous waste management programs had been established. Therefore, assumptions related to the WET method and associated STLCs should be carefully and rigorously evaluated to ensure that these assessments reflect current hazardous waste management practices. These include, but are not limited to, assumptions related to the drinking water standards, the attenuation factor used to establish the STLCs, and the individual components of the test method itself, including the type of extractant acid and the length of time the waste is exposed to that acid.

- The establishment of the current STLCs was dependent on assumptions related to the type and conditions of the landfill where a particular waste would be disposed of. The term “secure landfill” is used in the FSOR but was not defined in the FSOR document, statute, or regulations at the time of adoption. It is unclear what was considered a “secure landfill” when the WET method and associated STLCs were being developed. Any further evaluation of STLCs should include an investigation of what was considered a “secure landfill” at the time and a comparison between that type of landfill and current design and construction standards for all types of landfills (e.g., municipal, construction and debris and hazardous waste).

- The review and evaluation of the associated safeguards pertaining to the current hazardous waste identification criteria to ensure that public health and the environment are protected.

- The evaluation of Contaminants of Emerging Concern to determine if it's necessary to add to these contaminants to current hazardous waste identification criteria for additional public and environment protection. Background and considerations for Contaminants of Emerging Concern are provided in Appendix E.

Department of Toxic Substances Control

CalEPA
California Environmental Protection Agency

Draft Hazardous Waste Management Report

Implementation of California Health and Safety Code Section 25135

Section 9

9. Conclusion and Future Work

Future planning efforts will provide the opportunity to identify hazardous waste management strategies that maximize the potential for waste reduction and recycling while ensuring protection of public health and the environment. To accomplish this, DTSC has identified four primary areas for future work based on consideration of public input and statutory requirements:

- Hazardous Waste Criteria
- Waste Reduction
- Capacity Assurance
- Environmental Justice

9.1 Hazardous Waste Criteria

DTSC will evaluate California's current hazardous waste criteria to determine whether they are consistent with current science and technology. This review is a significant effort that will require additional research and collaboration with other internal programs and external agencies like the Office of Environmental Health Hazard Assessment. Evaluation of the criteria has begun and will include an assessment of the differences between California's criteria and U.S. EPA's criteria. Anticipated topics for review include, but are not limited to:

- The Waste Extraction Test (WET) method
- The Solubility Threshold Limit Concentration (STLC) hazardous waste regulatory threshold for lead
- Non-RCRA metals
- Comparison of federal and state testing methods
- Acute aquatic toxicity bioassay
- Chemicals of Emerging Concern
- The waste coding system and potential areas for improvement
- Landfill design and construction

DTSC will provide recommendations for future research and various hazardous waste criteria in the Plan.

9.2 Development of a Waste Reduction Strategy

Preliminary review of data prior to 2010, as well as prior research conducted in the Community Protection and Hazardous Waste Reduction Initiative, indicate that overall hazardous waste generation has decreased over time. DTSC will conduct research to understand the causes of this decrease. Once the causes are understood, a targeted and intentional approach to waste reduction could be developed that is focused on specific industry sectors or waste streams rather than establish a general reduction goal based on an overall percentage. This targeted approach may result in more direct positive impacts on environmental justice communities. It will be important to consider more efficient and sustainable strategies for managing waste, such as on-site treatment, on- and off-site recycling, pollution prevention, safer alternative products, and encouraging a more robust circular economy in California.

To accomplish waste reduction in an efficient and sustainable manner, DTSC must consider information such as the following to better inform which waste streams to prioritize:

- Technical aspects of manufacturing processes or other processes that generate hazardous wastes
- The composition of waste streams that are generated
- Consideration of where waste is generated (e.g., from a manufacturing process, cleanup project, or general construction)
- How wastes might be treated and whether the treatment itself generates a hazardous waste stream
- Whether there are regulatory or statutory limitations for treating the hazardous waste stream on-site or off-site
- Other implementation issues, such as hazardous waste storage logistics, energy use, water use, emissions, or time required for treatment

DTSC should encourage efforts to collect certain hazardous waste types such as universal waste and household hazardous waste in order to continue to promote proper management. The Department should also encourage the continued collection of wastes that are anticipated to decrease over time such as CRTs. The amount of CRTs collected, for example, will likely decrease as older CRT-based technologies have been replaced by newer technology, but it will continue to be important to ensure that these wastes are properly managed. A reduction in collection programs could result in improper and illegal management of hazardous waste.

While DTSC is not currently resourced to implement a waste reduction program, the Department will provide recommendations in the Plan regarding development of a program and strategies.

9.3 Development of a Capacity Assurance Strategy

Since the 1980s, California's stated intention has been to manage its hazardous waste within its own borders rather than depending on out-of-state facilities. Nonetheless, California has increasingly relied on out-of-state facilities. In order to manage more of its own hazardous waste, the state must ensure adequate capacity exists in California. The first step to ensuring adequate capacity is to quantify the current capacity. As such, DTSC will develop an estimate of the current capacity for hazardous wastes to be managed in California.

California identifies more wastes as hazardous than the federal program, thus requiring more wastes to be managed as hazardous. It is important to distinguish these additional wastes from federal hazardous wastes, understand the hazards they pose in comparison to federal hazardous waste, and ensure that they are managed in an appropriate, efficient, and sustainable manner.

DTSC will make recommendations in the Plan to identify opportunities to realize this goal.

9.4 Development of an Environmental Justice Strategy

Since the inception of DTSC, the Department has heard multiple concerns from environmental justice communities about the management of hazardous waste and site cleanups. Concerns have included, but not been limited to, the operation and zoning of hazardous waste facilities, cumulative impacts, the transportation of hazardous waste, and the consideration of community input.

Some of these concerns are difficult to address because they are outside of DTSC's authority. As an example, zoning and local governmental ordinances are determined at the city and county level, not at the state level. In addition, the risks posed by generators to surrounding communities should be considered in addition to the risks of TSDFs.

DTSC will seek community input from environmental justice communities regarding their concerns relating to the management of hazardous waste, including how it relates to site cleanups. DTSC's Hazardous Waste Plan Unit and Office of Environmental Equity will leverage ongoing outreach efforts across the department to collect information about concerns regarding hazardous waste management. DTSC will use information gathered from these discussions, including sea level rise, CalEnviroscreen analyses, and community surveys to inform and develop recommendations in the Plan.

9.5 Additional Questions and Data Gaps

There are additional questions that should be considered in preparation for the Hazardous Waste Management Plan. These include:

- Can non-RCRA contaminated soil safely be disposed of in non-hazardous waste landfills in-state?
- How has the limited national incinerator capacity affected California generators?
- Can incentives be provided to encourage hazardous waste facilities who plan to treat/recycle emerging waste streams?
- Which waste streams should be targeted for treatment or waste reduction?
- Are the additional permitting criteria regarding community protection and cumulative impacts for permitted facilities justified, as compared to the requirements for generators?

- Does the new fee structure incentivize fee payer behavior consistent with policy objectives?
- Should special considerations be made for soil that is identified as hazardous when generated due to naturally occurring metals?
- Should California endeavor to have enough in-state capacity to manage all non-RCRA hazardous waste?
- Should California review the federal exclusions to determine if some may be beneficial for waste reduction while maintaining protection of human health and the environment?

There are also several data gaps that may not be able to be resolved but should be researched. Among these are:

- The impacts of hazardous waste generators on communities
- The total disposal capacity and throughput capacity of TSDFs
- Quantification of on-site treatment and recycling of hazardous waste
- Complete analysis of data in HWTS prior to 2010
- Hazardous waste trends per industry (application of NAICS codes)
- How to best determine the number of RCRA and non-RCRA large quantity generators and small quantity generators based on information in HWTS
- The relative impacts of hazardous materials transportation compared to hazardous waste transportation
- Accessing the information in CERS and whether future CERS NextGen projects can facilitate hazardous waste data collection
- Obtaining more information regarding the generators of used oil
- Risks associated with different disposal scenarios for contaminated soil
- Evaluation of TRI data to determine its usefulness to the Plan
- Quantification of improperly disposed hazardous waste
- Design and protectiveness of non-hazardous waste landfills and variations between older and newer landfills

The data presented in this report provide information that will inform the 2025 Plan. This report identifies many challenges facing the state that warrant consideration in the Plan. Input from the Board of Environmental Safety and a wide range of stakeholders will be used to determine which data gaps might be closed in the coming years for the state to establish a robust strategy for managing hazardous waste into the future.