# 2025

# Hazardous Waste Management Plan

## Recommendations for a Modern Program

DTSC Department of Toxic Substances Control

CalEPA California Environmental Protection Agency

# Foreword

In 2021, the Legislature mandated DTSC to take a critical look at the hazardous waste management program and consider what the State needs to responsibly manage hazardous waste (Senate Bill 158, Ch. 73, St. 2021). California's hazardous waste management laws were established more than four decades ago, before much of the country's environmental laws were enacted. Hazardous waste management programs nationwide and in California now face a surge of waste streams that were hardly imagined when the laws were first designed. New and growing wastes streams like lithium-ion batteries from electric vehicles, vape pens, ear buds, scooters, and smartphones present unique challenges when they become wastes. Designing with the end of life in mind for these types of products and many others can improve the management of these products when they become wastes. If these wastes are mismanaged, they could pose a threat to human health and the environment and contribute to the harm experienced due to past practices.

DTSC plays a critical role in addressing pollution caused by more than a century of industrialization and use of hazardous materials. Hazardous waste management planning offers an opportunity to dive deeply into the very laws and regulations that govern how hazardous waste is identified and managed, and determine whether existing safety requirements sufficiently protect human health and precious resources like drinking water and ground water.

The 2025 Hazardous Waste Management Plan (Plan) is a steppingstone for a sustainable tomorrow. The Plan does not change any laws or regulations; instead, it offers an opportunity for DTSC to think holistically about improvements to the hazardous waste management program. The recommendations in this first Plan are intended to ensure hazardous waste is handled safely and appropriately within the system that exists today with an eye towards waste management strategies needed for the future. A truly transformative system requires input from communities, Tribal Nations, other state agencies, local governments (including Certified Program Agencies), academia, and the regulated community to work alongside DTSC to overcome barriers to source reduction, reuse, recycling, and treatment.

While DTSC can pursue some recommendations with existing resources, many of the recommendations in this Plan would require new resources to implement. Despite these limitations, DTSC will be intentional and thoughtful as it moves into the next cycle of planning efforts. Its work will continue to be shaped by sound science and critical analysis, the voices of those impacted by DTSC's work, and support of partners across all sectors.

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# Executive Summary

Health and Safety Code (HSC) section 25135 requires DTSC to develop a comprehensive Hazardous Waste Management Plan (Plan) every three years to 1) inform the management of hazardous waste in the state, 2) inform local hazardous waste management efforts, and 3) guide DTSC's implementation of its hazardous waste management program. The triennial Plan must be based on the findings of the preceding triennial Hazardous Waste Management Report (Report), plus any new information, and must include the 12 components outlined in the statute.

*To read California Health and Safety Code Section 25135, click the link below:*

**California Health and Safety Code Section 25135**

DTSC published the first Report in November 2023. The next Report is due to be presented to the Board of Environmental Safety (Board) by March 2026. After the first Report and prior to the release of the draft Plan, DTSC conducted ten (10) public workshops to receive input from interested parties on potential goals and recommendations. DTSC coordinated intensively with the Board on the draft Plan to receive their input and to present at public Board meetings.

The draft Plan included 10 goals and several recommendations to achieve them. DTSC presented the draft Plan at four (4) public hearings, discussed its content and intent with the Board, and listened to public feedback. The Board called on DTSC to focus on three principles: meaningfully reduce hazardous waste sent for land disposal or incineration, reduce health impacts from the entire hazardous waste management lifecycle, and create a sustainable infrastructure for better end-to-end management. The Board also recommended DTSC revise the Plan to emphasize source reduction as the first choice amongst the hierarchy of hazardous waste management options available and to set goals against which the Plan's success can be measured. The Board emphasized the need for DTSC to engage with interested parties, particularly with community members, to implement recommendations that DTSC anticipates may affect waste generation or management where they live.

### Finalizing the 2025 Plan

DTSC worked with the Board to evaluate each goal and recommendation considering the feedback received. As a result of those discussions, the goals and recommendations were restructured and made clearer. For example, recommendations for draft Goal 2, regarding access to educational material for interested parties, were integrated into other goals. Additionally, the Board voted to remove draft recommendation 7.2, regarding alternative management standards for certain waste soil. Minor revisions include editorial corrections/clarifications in the appendices, which DTSC has posted on its webpage alongside the draft Plan.

The 2025 Plan is organized into three ambitious goals with recommendations building upon each other. The goals and recommendations are intended to drive health protective outcomes for all of California, and they require work by many interested parties.

#### *Goal 1: Reduce hazardous waste generation and divert hazardous waste away from incineration or landfilling.*

DTSC recommends seven (7) strategies to critically evaluate local, state, and federal policies to promote source reduction, waste reduction, and diversion to minimize the overall amount of hazardous waste that is sent to be landfilled or incinerated. The recommendations focus on laying the foundation for an informed waste reduction and diversion program involving collaboration between DTSC, local government agencies, generators, and other interested parties.

#### *Goal 2: Ensure hazardous waste identification and management standards are scientifically sound, health protective, and environmentally safe.*

DTSC recommends ten (10) strategies to pursue statutory and/or regulatory changes that ensure hazardous waste is appropriately identified and managed safely. The recommendations focus on criteria for ignitability, corrosivity, and reactivity, while continuing research on toxicity. In addition, this goal includes recommendations that promote less impactful management of some hazardous wastes.

***Goal 3: Use data and resources to promote sustainable and health protective management from cradle to grave.***

DTSC recommends ten (10) strategies to improve the data that underpins DTSC's hazardous waste management framework and use it to inform continuous planning efforts. The recommendations focus on collecting and using data to adapt California's standards to changing waste management needs, including minimizing the impacts of emerging waste streams.

## Limitations of the 2025 Plan

The 2023 Hazardous Waste Management Report and subsequent analysis have shown that the amount of hazardous waste generated annually can vary significantly, leading to episodic increases and decreases in the total amount being managed. Trends in hazardous waste management can take many years to crystalize, so changes in waste management practices or the total amount of hazardous waste that is diverted from landfills or incineration may not be apparent in triennial Reports or Plans.

Fully implementing the Plan's recommendations could be limited by DTSC's current authority, sphere of influence, and available resources. The recommendations may be limited by information gaps and several entail additional technical research and work with subject matter experts to refine more specific recommendations. Some recommendations require coordination with other agencies and the Legislature because DTSC does not have authority over every aspect of waste management. Lastly, it is important to note that much of this work could require additional funding and resources. For DTSC, an agency that is primarily funded through fees, this could require increasing fees to fully implement the recommendations. DTSC acknowledges it is a tough time to raise fees, especially since recent reforms have already resulted in significant fee increases. Ultimately, however, DTSC does not have authority to raise fees; that authority rests with the Board of Environmental Safety and the Legislature. Therefore, fully implementing the recommendations in this plan would require buy in from interested parties, the Board of Environmental Safety, and the Legislature. In any case, DTSC will continue to work with all interested parties to address these limitations over the course of future Reports and Plans.

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# About the Department of Toxic Substances Control

The Department of Toxic Substances Control (DTSC) is California's lead regulatory agency for the management of hazardous waste. DTSC regulates hazardous waste, oversees cleanups of contaminated sites, and works to advance products that are chemically safer. DTSC's mission is to protect California's people, communities, and environment from toxic substances, to enhance economic vitality by restoring contaminated land, and to compel manufacturers to make safer consumer products. DTSC's vision is all of California thriving in a healthy environment.

DTSC shares oversight responsibilities with other state agencies, such as the California Department of Resources Recycling and Recovery (CalRecycle) and the State Water Resources Control Board, for the management of some hazardous wastes. DTSC also coordinates with the Certified Unified Program Agencies (CUPAs) that are certified by the California Environmental Protection Agency (CalEPA) to implement and enforce hazardous waste management requirements at the local level.

# Vision and Purpose of the 2025 Plan

California pioneered the nation's first hazardous waste control laws in the 1970s, which predated and influenced the United States Environmental Protection Agency's (U.S. EPA) Resource Conservation and Recovery Act (RCRA). Since then, California's hazardous waste management program has remained more stringent and broader in scope than the federal RCRA program. To this end, DTSC envisions a modern hazardous waste management model that continues its role as a leader in health and environmental protections.

Health protective standards are touchstones for safely managing hazardous waste. DTSC aims to promote sustainability, products and technology designed with end-of-life in mind, and health protective management practices through source reduction, reuse, recycling, and treatment. In addition, California's investment in research and innovation will inform waste management needs as it strives towards a modern hazardous waste management model that mitigates harmful impacts on communities.

Hazardous waste management planning is an ongoing and iterative process, with a state Plan to be drafted every three years as delineated in HSC § 25135. The Hazardous Waste Management Plan serves as:

- A comprehensive planning document for the management of hazardous waste in the state.
- A source of useful information to guide state and local hazardous waste management efforts.
- A guide for implementation of DTSC's Hazardous Waste Management Program.

The Plan serves as a guide for local and state agencies, and also all others involved in the management of hazardous waste. The 2025 Plan presents three overarching goals for hazardous waste management in California. These goals are high-level priorities for attaining DTSC's vision of all of California thriving in a healthy environment. Each goal includes recommendations that serve as tangible steps for California to advance each goal. Recommendations are intended to guide the State towards feasible solutions to reduce waste and enhance the health and safety of residents and the environment.

# 2023 Hazardous Waste Management Report

## Key Findings

*Click the link below to read the full Report online.*

**2023 Hazardous Waste Management Report**

As required by statute, the 2025 Plan's goals and recommendations are informed by the 2023 Hazardous Waste Management Report's key findings:

- The department's Hazardous Waste Management Program (HWMP) has not focused on waste reduction since its Pollution Prevention (P2) program was eliminated in 2013, leading to data gaps and lagging management standards for new waste streams.
- The total amount of hazardous waste has decreased by 40% over the last twenty (20) years as new types of waste streams are emerging or anticipated to increase. However, new types of waste streams are emerging and DTSC anticipates this will lead to an increase in total tonnage of hazardous waste.
- The number of in-state hazardous waste facilities decreased from more than 400 in 1983 to fewer than 100 in 2021.
- At the current pace of in-state disposal, the two hazardous waste landfills in California will reach full capacity in 2039 unless additional capacity is constructed.
- In-state capacity for recycling and treatment is unlikely to increase without changes to the overall regulatory system.

## Hazardous Waste Generation

Under both federal and California law, generators of hazardous waste are responsible for determining whether the waste is a hazardous waste as defined in federal and state regulations. Generally, hazardous waste is identified 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). California's hazardous waste criteria are more stringent and broader in scope than federal criteria under RCRA, which results in more waste identified as hazardous waste in California than federally or in other states. RCRA hazardous wastes are those identified as hazardous by RCRA, and non-RCRA hazardous wastes are the wastes considered hazardous only in California. Generators of hazardous waste are required to use a manifest when shipping hazardous waste off site. As such, California's manifested hazardous waste is organized into two categories: "RCRA hazardous waste" and "non-RCRA hazardous waste."

From 2010 to 2021, generators in California manifested 20.68 million tons of hazardous waste and ranged from about 1.41 million tons to 1.98 million tons of hazardous waste per year. Of that waste, California manifested 16.7 million tons of non-RCRA hazardous waste and 3.7 million tons of RCRA hazardous waste, as shown in Figure 1. The 16.7 million tons of non-RCRA waste represents more than 80 percent of the manifested hazardous waste generated. Therefore, any meaningful reduction and diversion goals will need to address non-RCRA hazardous wastes.

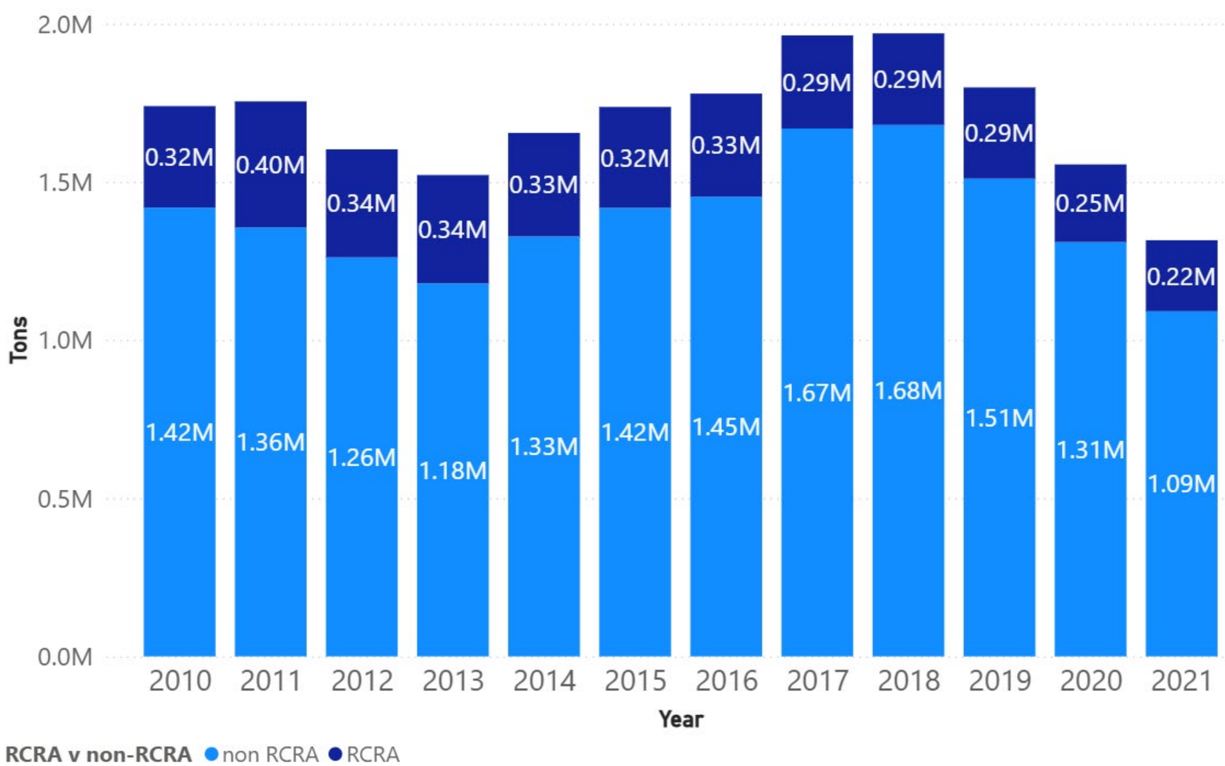


*Figure 1 – Amount of RCRA and Non-RCRA Manifested Hazardous Waste from 2010-2021*

## Hazardous Waste Disposition

There are multiple disposition options for hazardous waste, and generators are responsible for manifesting and arranging for the transportation of their hazardous waste to a destination facility. The term "destination facility" in this section refers to all destinations of hazardous waste.[1] This may include, but is not limited to, recyclers, treatment facilities, disposal facilities, and many out-of-state non-hazardous waste landfills. Hazardous waste is sent to these facilities for recycling, treatment, and/or disposal. From 2010 to 2021, California generators produced 20.68 million tons of manifested hazardous waste. Due to several factors, not all hazardous waste generated in California is managed within California. Of this total tonnage, 53.2 percent of manifested hazardous waste was managed within the state while the remaining waste was managed in other states like Arizona, Utah, and Nevada (Figure 2).

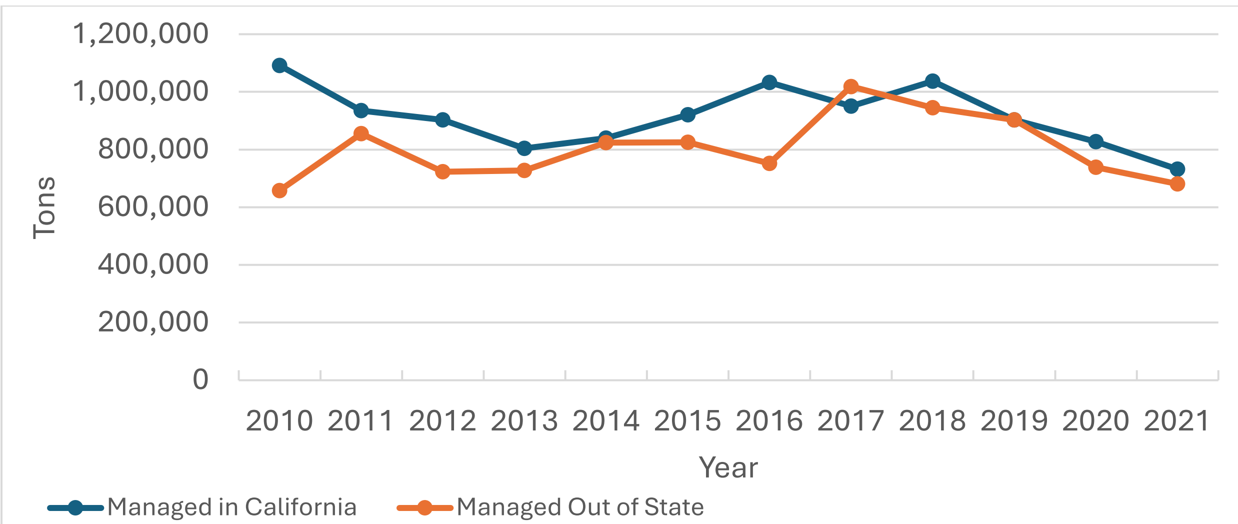


*Figure 2 – Annual Tonnage of California's Manifested Waste: Managed in California and Managed Out of State from 2010-2021*

Land disposal has been one of the most common waste management methods in the United States, and it is the most common method for managing manifested hazardous waste generated in California (Figure 3). Since 2010, 59.2 percent of the manifested

[1] Destination facilities may include, but not be limited to, recyclers, treatment facilities, disposal facilities, and many out-of-state non-hazardous waste landfills. Many states, like Utah or Arizona, do not recognize non-RCRA hazardous wastes to be hazardous in their state. Therefore, many non-RCRA hazardous wastes are not typically disposed of in a hazardous waste landfill.

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 (5.09 million tons) of the total. [2] Incineration (Management Method Code: H040) is the third most common method; however, it has only been used for 2.95 percent (620,000 tons) of the hazardous waste managed between 2010 and 2021. The remaining management methods are composed of 24 management codes or uncategorized manifest information and are shown as "Other" in Figure 3, below.

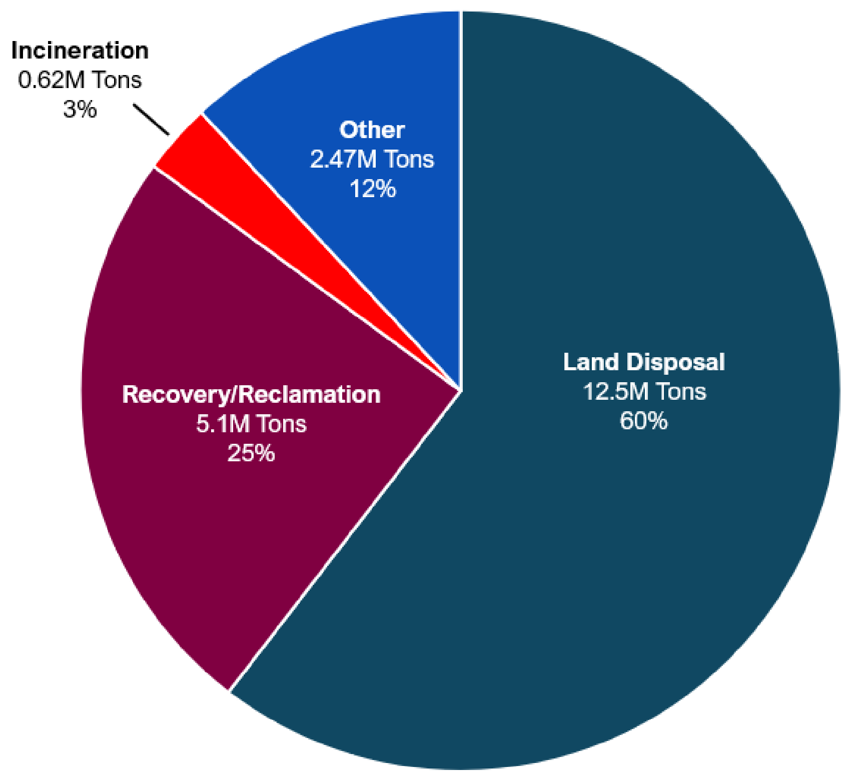


*Figure 3 - Waste Management Methods in California since 2010*

Land disposal is the least preferred method of hazardous waste management according to the hazardous waste management hierarchy, which will be discussed further below.

[2] H039 is a reclamation and recovery management code for hazardous waste that include acid regeneration, organic recovery, and other management options. Reclamation and recovery are forms of recycling.

Incineration of hazardous waste is considered treatment, and therefore often preferable to land disposal. However, there are concerns about the potential health impacts of hazardous waste incinerators, which makes incineration a less preferred management method than other treatment options. Furthermore, there are only two commercial hazardous waste landfills in California and no commercial hazardous waste incinerators in state, so capacity is limited for both management methods. National capacity for incineration is also limited and is a barrier to proper management of incinerable wastes.

### Data Gaps

DTSC identified several data gaps in the 2023 Report that many of the recommendations in this Plan are meant to address. These data gaps are related to:

- Information and data regarding hazardous waste identification methods and thresholds,
- Hazardous waste generation data and data collection,
- Throughput and disposal capacity for onsite and offsite treatment at generators and TSDFs,
- Quantification of improperly disposed waste, and
- Information about the people and places surrounding generators.

These data gaps indicate areas that DTSC needs to flesh out to provide the best solutions for hazardous waste management in California. Data gaps can lead to certain factors not being considered when making recommendations, and because of this, underlying problems or possible solutions might be overlooked. Addressing data gaps enhances the department’s ability to address current problems and predict future ones.

# Goal 1: Reduce hazardous waste generation and divert hazardous waste away from incineration or landfilling.

Hazardous waste management practices mitigate real and potential harm to people and the environment. There are a range of ways to manage hazardous waste, with source reduction and recycling/reuse being preferred over treatment and landfilling. Diverting hazardous waste from potentially harmful management options is another way to increase protection and ensure long-term, sustainable hazardous waste management. Goal 1 identifies the importance of both reducing hazardous waste generation and diverting hazardous waste from incineration and landfilling, the least desirable levels of the waste management hierarchy (Figure 4).

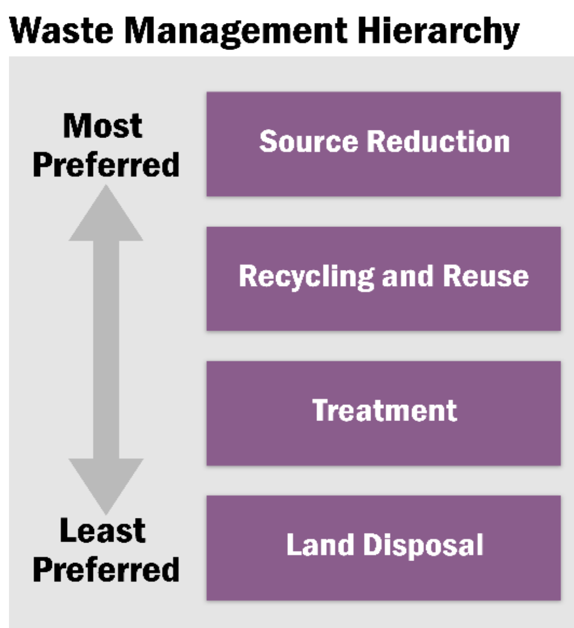


*Figure 4 – Waste Management Hierarchy*

Protective management capacity at each level of the hierarchy is necessary to protect Californians from the impacts of improper hazardous waste management. California takes an active and critical role in capacity assurance and planning so that waste management needs align with trends in waste generation. To do this, DTSC will continue to examine capacity at each management level of the waste management hierarchy, identify areas of concern, and develop plans that consider future needs. The planning efforts will add to the knowledge of the hazardous waste management system, help implement waste minimization programs, and encourage companies to replace inefficient treatment technologies with those that are safer and more innovative.[3]

Hazardous waste is generated from a multitude of industries and processes, each with different potential for reduction and diversion. In setting source and waste reduction goals, DTSC must consider the specific waste stream, industry, and constituent to determine what levels of the hierarchy are most appropriate. These goals may not always be quantitative. For example, goals may promote specific recycling or treatment technologies rather than set a reduction target for a specified amount of waste. Goals may also include encouraging a holistic view of materials that yield hazardous waste, including designing products with the end of life in mind.

DTSC is currently investigating two waste streams: incinerable waste and lithium-ion batteries. Incinerable waste is a waste that is sent to a hazardous waste incinerator. Although incinerable waste makes up a small percentage of California's hazardous waste, it is a good candidate for reduction and diversion goals because it is difficult to safely manage; there is a nationwide shortage of commercial incinerator capacity, and there are many health concerns for communities near commercial incinerators. Lithium-ion batteries are best suited for diversion efforts, rather than reduction, as they are an integral piece of the transition from fossil fuels to renewable energy and the waste stream is expected to grow. However, there are many barriers to recovery, reuse, or recycling, particularly of large format lithium-ion batteries, in California, including a burdensome permitting process.

Another challenge is the lack of a waste reduction and diversion program within DTSC. For over 25 years, DTSC's Pollution Prevention (P2) program dedicated resources to researching and developing source reduction and waste reduction recommendations. This program also worked with generators and facilities to improve their processes within existing laws. However, in 2013, the P2 program, along with its budget and personnel, was converted into the department's first Green Chemistry program, the Safer Consumer Products (SCP) program, with the intent of preventing hazards from entering the marketplace. SCP and the former P2 program share common goals of harm

[3] United States Environmental Protection Agency, National Capacity Assessment Report, January 2025, (Page 28)

prevention, where SCP focuses on reducing harm in consumer products before they become a waste. The former P2 program also provided additional benefits by encouraging harm prevention in other ways by focusing on all hazardous waste streams regardless of whether the final consumer product is considered hazardous. DTSC aims to rebuild an informed waste reduction and diversion program that improves its overall prevention strategy by focusing on specific waste streams, industries, and hazardous constituents while SCP continues to leverage its influence in product stewardship. A modern P2 program could serve as a bridge between green chemistry and waste management, to also promote designing products and processes that enable components to be reused, repurposed, or recovered.

## Goal 1 Recommendations

Under this goal, DTSC recommends seven strategies to critically evaluate local, state, and federal policies to promote source reduction, waste reduction, and diversion to minimize the overall amount of hazardous waste that is sent to be landfilled or incinerated. The recommendations focus on laying the foundation for an informed waste reduction and diversion program involving collaboration between DTSC, local government agencies, generators, and other interested parties.

### Recommendation 1.1

Establish a hazardous waste reduction program to focus on source reduction, hazardous waste diversion, and treatment. Once established, the responsibilities of this waste reduction program could include:

a) Identifying specific hazardous waste streams, hazardous waste constituent types, or industry types to include in each triennial Plan (for example, see Recommendation 1.5).
b) Evaluating data compiled from Senate Bill (SB) 14 hazardous waste source reduction reports and collected in a public facing database (see Recommendation 3.8).
c) Piloting source reduction technologies and activities.
d) Promoting legitimate recycling and treatment as additional options within the waste reduction and diversion framework.
e) Developing a hazardous waste reduction grant program to incentivize waste reduction best practices by generators (e.g., upgrades to more efficient equipment or technology)

**Recommendation 1.2**

Review federal recycling exemptions and exclusions, such as the Generator-Controlled Exclusion, Transfer-Based Exclusion, and Remanufacturing Exclusion, and analyze the process for siting new hazardous waste facilities (Assembly Bill 2948, Ch. 1504, St. 1986, also known as the "Tanner Act"). A preliminary analysis of these processes can be included in subsequent Reports and Plans as information becomes available.

**Recommendation 1.3**

In partnership with other local and state regulators, facilitate an internal workgroup to compile information on lithium-ion batteries to determine how the waste management hierarchy can be applied to this growing waste stream. Engage with non-governmental experts to develop management strategies for this waste stream. Provide an update on its estimates for the quantity of lithium-ion batteries expected to reach end-of-life in the 2026 Report and propose reduction or diversion goals in the 2028 Plan.

**Recommendation 1.4**

Work with stewardship organizations and manufacturers to evaluate the effectiveness of product stewardship models, such as extended producer responsibility programs, that have been implemented or considered in California and other states.

**Recommendation 1.5**

Collaborate with generators of incinerable wastes to evaluate existing management practices to identify opportunities for source reduction, legitimate recycling, and alternative treatment of incinerable waste.

**Recommendation 1.6**

In partnership with other local and state regulators, create a workgroup to evaluate the state’s capacity for hazardous waste management at all levels of the hierarchy, maintain federal capacity requirements, implement waste minimization programs, and encourage companies to replace inefficient treatment technologies with safer and more innovative technologies.

**Recommendation 1.7**

Collaborate with local oversight agencies to identify potential onsite treatment technologies and waste streams that may be appropriately managed under California’s lower tier permits, with a focus on incinerable waste, and include a preliminary analysis in a future Plan.

# Goal 2: Ensure hazardous waste identification and management standards are scientifically sound, health protective, and environmentally safe.

Proper hazardous waste management requires accurate identification of hazardous wastes and the application of sufficient management standards throughout the cradle-to-grave life cycle to eliminate or mitigate impacts to public health and the environment. Recommendations included in this goal are related to the identification of hazardous waste, management methods that reduce health impacts, and identification of wastes that may be managed under different standards while remaining as or more protective.

Hazardous waste is primarily identified in two ways, by being specifically listed as a hazardous waste (Listed Hazardous Wastes) or by being identified by tests and certain criteria as a characteristic hazardous waste (Characteristic Hazardous Wastes).[4] If a solid waste shows up on any of five different lists the waste is, by default, identified as a listed hazardous waste. Characteristic hazardous waste on the other hand, are not listed and instead are identified based on a series of criteria and tests. Some criteria are used to also identify exclusions and exemptions.[5] The hazardous waste criteria define the specific wastes, constituents of concern, the scenarios under which those constituents may pose a risk, and the threshold levels at which a waste is considered hazardous.[6] The primary purpose for the criteria is to identify waste materials which pose a substantial threat to human health and the environment if not managed in a controlled and systematic manner. Identification of these wastes helps to then identify the most appropriate management method to ensure people, and the environment are protected

[4] For further information about hazardous waste identification criteria, see: Website Link

[5] California list of Exclusions and Exemptions are outlined in: 22 CCR section 66261.4, HSC section 25124, HSC section 25143.2, U.S. EPA Solid Wastes which are Not Hazardous Wastes are outlined in 40 CFR §261.4(b): U.S. EPA Exclusions and Exemptions can be accessed at: Website Link

[6] The five lists (F, K, P, U, and M) and four characteristics (Ignitability, Corrosivity, Reactivity, and Toxicity) are explained in further detail online: Website Link

from potential harms posed by hazardous wastes in different scenarios, such as in air that we breathe or water that we drink.

Compared to federal hazardous waste criteria, California's criteria include more constituents and scenarios that consider whether a waste's constituents might harm human health or the environment. California's hazardous waste criteria was largely developed in the 1970s, and additional evaluation using modern standards and best available technologies may be necessary:

- California's criteria for the characteristics of ignitability, corrosivity, and reactivity have not been updated to incorporate modern lab equipment, such as digital thermometers, and contain outdated references, such as references to outdated agencies.
- California's toxicity characteristic is significantly different from the federal criteria. Where U.S. EPA only specifies the Toxicity Characteristic Leaching Procedure (TCLP), California's criteria include the TCLP along with three other analytical tests (Waste Extraction Test (WET), total digestion test, and acute aquatic bioassay) and four non-analytical measures of toxicity (acute dermal, acute oral, acute inhalation, and carcinogenicity).

Evaluating waste criteria is a time intensive undertaking because it involves several inter-related elements. Each test method is designed to model potential harms that could result from hazardous waste not being properly managed (e.g. leaching into soil, release into lakes or rivers, etc.). To evaluate test methods, DTSC must first consider what scenario a particular method is designed to represent. For example, the acute aquatic bioassay is a test to identify if constituents in a waste may be toxic to aquatic organisms, such as fish.

DTSC's initial evaluation of the criteria for ignitability, corrosivity, and reactivity led to the recommendations provided below. DTSC began, but has not completed, evaluation of the toxicity criteria, so no changes to the current toxicity criteria are recommended in this Plan. Evaluation of toxicity criteria includes the acute aquatic bioassay, the WET, and other methods used in the United States and internationally to identify wastes that are hazardous due to their aquatic toxicity or leachability. However, while resources were allocated through Senate Bill 158 (Ch. 72, St. 2021), they were not designated for hazardous waste management planning and were instead shared with other program activities. Therefore, the timeframe for completing these evaluations remains uncertain, and dedicated personnel may be required to ensure timely progress.

Another aspect of waste criteria are the constituents in hazardous waste determinations. For example, some metals are identified in California as hazardous even though they are not regulated as hazardous waste constituents federally. There are also emerging constituents, such as per- and polyfluoroalkyl substances (PFAS), for which more analysis is needed to determine whether it should be regulated as hazardous. DTSC also expects several new waste streams to be derived from technology or resources that support broader environmental goals. For example, direct lithium extraction technologies at geothermal facilities support statewide goals for renewable energy and domestic lithium sourcing. As these new technologies grow in California, DTSC will work with stakeholders to gather more information on the hazardous waste generated and best practices for making waste determinations.

In addition to the waste criteria, management standards provide the framework for environmentally protective waste management by specifying how hazardous waste must be managed. For certain hazardous waste, it can be possible to establish alternative management standards (AMS) that are different from standard management practices and still health protective. Senate Bill 158 requires DTSC to consider if there are non-RCRA wastes that can be managed with AMS while being protective of public health and the environment. These considerations are complex and depend on the specific waste stream, its potential to be managed under different standards than is currently required, and whether different standards already exist but are prohibited in California.

To maintain California’s leadership in environmental and public health protection, hazardous waste criteria must remain up to date through continuous dedicated research, analysis, and considerations of the latest scientific advancements.

## Goal 2 Recommendations

Under this goal, DTSC recommends ten (10) strategies to pursue statutory and/or regulatory changes that ensure hazardous waste is appropriately identified and managed safely for ignitability, corrosivity, and reactivity, while continuing research on the toxicity criteria. In addition, this goal includes recommendations that promote less impactful management of some hazardous wastes.

### Recommendation 2.1

Update regulations to reflect current regulatory cross-references and delete outdated and obsolete references.

### Recommendation 2.2

Adopt the two updated American Society for Testing and Materials (ASTM) standards that allow the use of non-mercury thermometers in the ignitability determination test method.

### Recommendation 2.3

Continue to evaluate the acute aquatic bioassay and comparable methods used in other states or nations to assess its effectiveness in determining aquatic toxicity.

### Recommendation 2.4

Continue to evaluate the WET and other leachability tests used globally to assess effectiveness at determining how soluble constituents in waste leach in a landfill.

**Recommendation 2.5**

Continue to evaluate the exposure levels for non-RCRA metals to assess their potential for harm.

**Recommendation 2.6**

Continue to evaluate the hazardous waste total threshold limit concentration (TTLC) and soluble threshold limit concentration (STLC) levels for lead to assess whether these standards are still health protective.

**Recommendation 2.7**

Continue to evaluate contaminants of emerging concern (CECs), such as per- and polyfluoroalkyl substances (PFAS), including determining whether such substances meet the criteria for hazardous waste under federal and state regulation.

**Recommendation 2.8**

Reduce negative impacts to communities when evaluating options to remediate sites.

a) Disseminate the Community Considerate Cleanups (C3) Quick Reference Guide to encourage treatment of soil whenever possible and to reduce community impacts of cleanups where excavation is necessary.
b) Explore funding sources to establish a permanent Cleanup in Vulnerable Communities Initiative (CVCI) Program and evaluate the feasibility of soil treatment studies at orphan sites.

### Recommendation 2.9

Collaborate with energy resource businesses to analyze the type and amount of hazardous waste from new, direct lithium extraction technologies at geothermal facilities to understand the chemical composition of the waste, anticipated volume to be generated, and recommend cost-effective management standards that prevent harm.

### Recommendation 2.10

Include information for at least one non-RCRA waste in each future Report and consider factors such as volume, management challenges, and data availability, to recommend appropriate management standards in future Plans.

# Goal 3: Use data and resources to promote sustainable and health-protective management from cradle to grave.

Hazardous waste management requires an in-depth understanding of how hazardous waste generation and capacity changes over time. DTSC's current reporting requirements and databases for hazardous waste were instrumental for the 2023 Report as they provided information to analyze California's various waste streams and indicated potential improvements to current reporting systems. Furthermore, public comments and internal review highlighted additional research opportunities and databases to analyze. Some of these have led to recommended changes, such as modifying waste codes to more accurately classify waste, increasing reporting requirements for some industries, and amending regulations to require generators to submit source reduction documents to a public-facing database. In addition, some safety issues are hard to address without knowing their extent. For example, hazardous waste such as batteries pose safety concerns when improperly managed at non-hazardous waste landfills. Having data on how often and where this occurs is essential for identifying problems and proposing solutions. Collectively, improving the State's access to data within each level of the waste management hierarchy will improve DTSC's ability to support protective management standards.

The 2023 Report also identified financial instruments (e.g., taxes and fees) as a potential tool to discourage hazardous waste generation, as well as incentivize sustainable technology and methods. Researching funding frameworks and how financial instruments can impact hazardous waste generation and support departmental operations is critical because fees are the primary funding source for DTSC's HWMP. Fees enable DTSC to conduct inspections, enforce laws and regulations, and do waste evaluations. However, more data is needed to determine how financial instruments may accomplish these goals.

For DTSC to promote sustainable management that is protective and supports source reduction, reuse, and legitimate recycling, DTSC will review relevant databases, reports, and notifications to forecast hazardous waste generation and capacity in California. Recommendations within this goal outline opportunities for DTSC to expand or improve upon currently available data and resources to prepare California for both new and existing waste streams.

## Goal 3 Recommendations

Under this goal, DTSC recommends ten (10) strategies to improve the data that underpins DTSC's hazardous waste management framework and use it to inform continuous planning efforts. The recommendations focus on collecting and using data to adapt California's standards to changing waste management needs, including minimizing the impacts of emerging waste streams. Many of these recommendations build on work that DTSC is already doing, while others are contingent upon dedicated resources.

### Recommendation 3.1

Collaborate with the Board of Environmental Safety, along with other partners, to continue to explore and evaluate funding frameworks that provide a sustainable funding structure while also encouraging reduction of hazardous waste generation.

### Recommendation 3.2

Adopt regulations to update California Waste Codes 611 (Contaminated soil from site clean-ups) and 181 (Other inorganic solid waste) to identify the inorganic hazardous constituents that cause the waste to be identified as hazardous.

### Recommendation 3.3

Collaborate with other state and local agencies to evaluate how much household hazardous waste is improperly sent to non-hazardous waste management facilities (e.g., material recovery facilities, non-hazardous waste landfills, and transfer stations) and include updates in future Reports.

**Recommendation 3.4**

Work with manufacturers, retailers, regulatory agencies, and other groups to analyze end-of-life lithium-ion batteries and end-of-life solar panels to determine California's readiness to manage alternative energy waste streams. Include updates in future Reports.

**Recommendation 3.5**

Amend reporting requirements for universal waste photovoltaic modules to require reporting in weight only, instead of count or weight, and evaluate reporting requirements for universal waste electronic devices.

**Recommendation 3.6**

Collaborate with academia and other partners to evaluate areas surrounding generators of recurring waste streams in California and include a preliminary analysis of one generator subset, incinerable waste generators, in future Reports.

**Recommendation 3.7**

Collaborate with other state agencies to make information about on-site treatment and recycling information more accessible in the California Environmental Reporting System (CERS).

**Recommendation 3.8**

Amend California’s Waste Minimization regulations (SB 14) to require generators to submit SB 14 source reduction report information to a public-facing database.

**Recommendation 3.9**

Evaluate SB 14 source reduction reports to determine how they may be used to forecast generation of incinerable waste and include updates in future Reports.

**Recommendation 3.10**

Collaborate with other state and local agencies to determine whether additional or new reporting methods are needed for waste streams currently subject to alternative tracking standards and include updates in future Reports and Plans.

# Next Steps

Hazardous waste management planning is an ongoing and iterative process that must be completed through collaboration with local and state agencies and other interested parties. This iteration of the Plan lays the groundwork to identify resource needs and information needed to facilitate hazardous waste management that follows the principles of the hazardous waste management hierarchy.

DTSC has also begun the next stages of research for the upcoming Reports and Plans based on recommendations for further research. The next Report is due in March 2026 and the next Plan is due in March 2028. Future Reports and Plans will build off this first iteration and incorporate new issues as they arise to prioritize strategies that reduce health impacts and environmental harm.

# Definitions

**Acute Aquatic Toxicity Test Method (Acute Aquatic Bioassay):** A short-term laboratory procedure used to determine the concentration of a substance that produces a toxic effect on a specified percentage of test organisms within a fixed period of exposure time. In California's hazardous waste criteria, the acute aquatic toxicity test method provides data used for calculating the concentration of a substance that causes the death of 50% of test fish ($LC_{50}$) within a 96-hour exposure period.

**Cradle to Grave:** Refers to the premise of hazardous waste management beginning with the generator ("cradle") and including all steps as the hazardous waste makes its way to the final destination of treatment, storage, and disposal facilities ("grave").

**Diversion:** Refers to utilization of management methods such as recycling and reuse to divert hazardous waste from being disposed of in landfills or managed in less preferred methods such as incineration. Diversion differs from Source Reduction because it focuses on the other levels of the hazardous waste management hierarchy – Recycling and Reuse, and Treatment – that are applicable after the waste has already been generated to delay or otherwise prevent disposal by land.

**End-of-Life:** The last stage within the life cycle of a product. A product at this stage generally has fulfilled its intended use and is no longer utilized, stored, or reused and requires specific management to determine its final destination, be it destruction, disposal, or recycling.

**Flashpoint:** The lowest temperature of a liquid at which sufficient vapor is generated to create a flammable mixture with air in the presence of an ignition source.

**Hazardous Waste Criteria:** The identification process to determine whether a waste meets the definition of hazardous waste based on established criteria. These criteria include specific characteristics (ignitability, corrosivity, reactivity, and toxicity) and listing provisions, as defined in RCRA listings.

**Hazardous Waste Management Capacity:** A measure of how much waste can be recycled, treated, or disposed of in a specific process or at a specific facility. Measuring the hazardous waste management capacity of California's hazardous waste management facilities requires an estimate of the amount of waste that can safely pass through a system and an estimate of the remaining volume of landfills. The lack of capacity, and especially access to capacity, can lead to improper or illegal disposal.

**Leachate:** The liquid formed when rainwater or other liquids filter through wastes placed in a landfill. When this liquid comes in contact with buried wastes, it leaches, or draws out, chemicals or constituents from those wastes.

**Leaching Test:** The test used to measure the amount of constituent mass that is released from a solid material into a set volume of water under specified laboratory conditions. The data collected from leaching tests is an estimate of how a constituent will leach when managed in the field. Examples of leaching tests are U.S. EPA's Toxicity Characteristic Leaching Procedure (TCLP) and California's Waste Extraction Test (WET).

**Non-RCRA Metals:** The additional nine metals, beyond the seven metals regulated under the federal Toxicity Characteristic, that are regulated and used to identify toxic wastes using the Waste Extraction Test (WET) in California. These include antimony, beryllium, cobalt, copper, molybdenum, nickel, thallium, vanadium, and zinc.

**Soluble Threshold Limit Concentration (STLC):** Refers to the solubility of a waste's constituents, using the specific laboratory test (WET) to measure this solubility. The STLC is the concentration used to identify the waste as hazardous under California regulations (for non-RCRA waste).

**Source Reduction:** As defined in Health and Safety Code (HSC) Section 25244.14, an action that either 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. Source reduction includes, but is not limited to, input changes, operational improvements, production process changes, and product reformulation. 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.

**Total Threshold Limit Concentration (TTLC):** Refers to the total concentration of a specific substance in waste material. The TTLC is the concentration used to identify the waste as hazardous under California regulations (for non-RCRA waste).

# Acronym List

| ACRONYM | Description |
|---|---|
| **AMS** | Alternative Management Standards |
| **ASTM** | American Society for Testing and Materials |
| **C3** | Community Considerate Cleanups |
| **CalEPA** | California Environmental Protection Agency |
| **CalRecycle** | California Department of Resources Recycling and Recovery |
| **CEC** | Contaminants of Emerging Concern |
| **CERS** | California Environmental Reporting System |
| **CUPAs** | Certified Unified Program Agencies |
| **CVCI** | Cleanup in Vulnerable Communities Initiative |
| **DLE** | Direct Lithium Extraction |
| **DTSC** | Department of Toxic Substances Control |
| **EOL** | End-of-Life |
| **HSC** | Health and Safety Code |
| **HWMP** | Hazardous Waste Management Program |
| **non-RCRA** | California-Only Hazardous Waste |
| **P2** | Pollution Prevention |
| **PFAS** | per- and polyfluoroalkyl substances |
| **Plan(s)** | Hazardous Waste Management Plan(s) |
| **RCRA** | Resource Conservation and Recovery Act |
| **Report(s)** | Hazardous Waste Management Report(s) |
| **SB 14 Report** | Senate Bill 14 Source Reduction Report |
| **SCP** | Safer Consumer Products |
| **STLC** | Soluble Threshold Limit Concentration |

| ACRONYM | Description |
| --- | --- |
| **TAG** | Technical Assistance Grants |
| **TCLP** | Toxic Characteristic Leaching Procedure |
| **TSDFs** | Treatment, Storage, and Disposal Facilities |
| **TTLC** | Total Threshold Limit Concentration |
| **U.S. EPA** | United States Environmental Protection Agency |
| **WET** | Waste Extraction Test |