



# PUBLIC HEALTH

Solid Waste and Environmental Outreach

## Residential Battery Recycling in Clark County



May 2020

The purpose of solid waste management activities in Clark County is to protect and preserve human health, environmental quality and natural resources through efficient, cost-effective programs and services.

**Clark County Solid Waste Management Plan, 2015**

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## EXECUTIVE SUMMARY

Today's batteries are inexpensive, numerous and energy dense, which has created problems for the waste and recycling industry. This report describes the challenges of collecting residential batteries for recycling, and incorporates available research from peer-reviewed journals, federal authorities and industry leaders to recommend ten response options to mitigate challenges.

### Challenges summarized:

- Battery waste is increasing rapidly
- Lithium-ion and lithium-polymer batteries start fires when damaged
- Fires are becoming more common in hauling trucks and at transfer stations
- Curbside battery collection is logistically challenging
- Curbside battery collections are contaminated with non-program batteries and electronics
- Outreach for battery recycling is difficult due to diverse battery types and technology
- Access to battery recycling is limited for multi-family residents
- Technology changes rapidly and it is challenging to adapt recycling systems

### Response options summarized:

1. **(Priority)** Formally ban lithium-ion/lithium-polymer batteries from curbside collections
2. **(Priority)** Add battery storage to collection trucks if continuing curbside collections
3. **(Priority)** Modify battery sorting at the transfer stations
4. Provide recycling drivers with educational tools
5. Create and implement a strong outreach campaign on battery recycling
6. Develop an alternative curbside battery collection program
7. Implement a multi-location battery recycling program
8. End curbside battery recycling and prohibit batteries from all curbside collections
9. Provide residents with branded tape and bags or boxes to use for battery recycling
10. Support battery product stewardship in Washington

These challenges and response options are explored in detail in this report. Clark County staff will work with regional partners and stakeholders to deliver final recommendations to implement to address battery recycling challenges. Clark County staff and partners will collaborate to make any changes to operations, outreach projects and recycling contracts as applicable.

## INTRODUCTION

Curbside collection of household batteries has been available in Clark County since 2003. When curbside battery collection began, the most common batteries were automotive lead-acid batteries and small household alkaline batteries. Today, technology and battery chemistry have changed, bringing new challenges to the recycling industry. Modern batteries are smaller, less expensive and more energy dense than batteries were in the early 2000s, justifying a new look at Clark County's battery recycling program.

This document addresses the various concerns surrounding battery waste, and provides several options for altering Clark County's battery recycling program to better mitigate the dangers involved, while maintaining convenient battery recycling for all residents. Clark County staff will work with partners and stakeholders to determine next steps and implement changes to reduce hazards involved with recycling batteries.

## BATTERY RECYCLING

Currently, Clark County single-family residents with recycling collection service can recycle household sizes of single-use<sup>A</sup> and rechargeable<sup>B</sup> batteries at the curb. Household sizes include AA, AAA, C, D, button cell, 9 volt, and other similar sized batteries. This "household" term is specific to the battery industry, and was a term developed to describe non-automotive batteries, which used to be limited to basic alkaline batteries. Many high-tech batteries can be found in households today, but do not qualify as "household" batteries, such as lithium-ion batteries.

Columbia Resource Company (CRC) owns and operates three transfer stations in Clark County and there is a HHW facility at each station. The HHW facilities have limited hours of operation when residents can drop off HHW, including batteries. The HHW is handled by technicians contracted by CRC through Stericycle, a permitted hazardous waste management company. Battery recycling at the curbside is managed by Waste Connections, the county's contracted residential recycling collection hauler.

In the curbside program, residents may set a clear plastic zip-top bag of household batteries on top of their recycling cart lid on collection day. Waste Connections recycling drivers will collect the batteries and place them in trays on the sides of the recycling trucks. All collected recycling is transported to CRC's West Vancouver Materials Recovery and Transfer Facility, known as "West Van." Once at West Van, the drivers unload the recyclables and sort the batteries by hand, separating alkaline batteries from rechargeable batteries. All batteries are then taken by Stericycle as Class 9 hazardous materials. The batteries are sent to various manufacturers and battery recycling facilities in the U.S.

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<sup>A</sup> Single-use batteries include alkaline, button cell, carbon zinc, lithium primary, mercury, silver oxide and zinc chloride. These batteries are not rechargeable.

<sup>B</sup> Rechargeable batteries include nickel cadmium, nickel metal hydride and nickel zinc batteries.

Prior to the curbside program, recycling for household batteries was not widely available for residents. One option for residents was to bring spent batteries to mobile recycling events, later known as Recycling Day Events (RDEs). RDEs were single-day collection events held in each community in Clark County throughout the year that served as mobile drop-off points for hard to recycle items and HHW, including batteries. These RDEs ended around 2015 and residents were encouraged to use the year-round disposal options at the transfer stations and HHW facilities.

RDEs hosted by Clark County ended for a few reasons. The primary reason was that these events, along with several other programs in the department, were funded by a grant that saw major reductions for that year. Additionally, since there were year-round disposal options available, the events were possibly encouraging residents to hoard their waste all year instead of promptly removing it from their households at any time by taking it a HHW facility at any of the three transfer stations. Lastly, the events had gained so much popularity that safety and traffic became an issue, and it is presumed to be safer to take HHW to a fixed facility over a mobilized operation.

## CLARK COUNTY DATA

The amount of batteries recycled through Clark County programs has increased dramatically in recent years. Figure 1 shows the quantities of household batteries recycled from 2000 to 2018 in Clark County from curbside collections, RDEs and fixed HHW facilities. This data shows that the quantity of recycled batteries has increased by 96% in this timeframe, which is significantly greater than the corresponding 28% increase in population.<sup>11</sup>

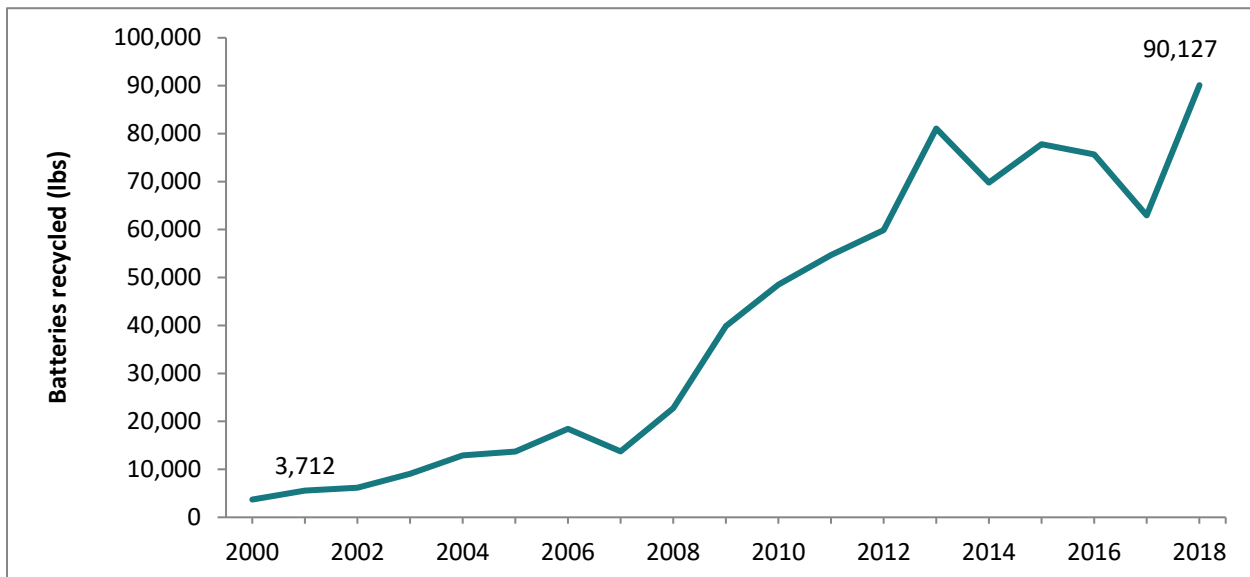


Figure 1: Quantities of residential household batteries recycled in Clark County from 2000 to 2018 in pounds.

Figure 2 builds on the data displayed in Figure 1, adding the quantities of automotive batteries recycled through public collections, and also separating the quantities of alkaline and rechargeable household batteries into two separate data series. The changes in battery quantities observed from 2000 to 2018 demonstrate the shifts in battery use and recycling trends. Notably, Figure 2 shows that collections of automotive batteries, also known as lead-acid batteries, have decreased significantly. The public shifted away from using the HHW facilities to recycle automotive batteries, largely due to lead-acid battery recycling legislation.

Lead-acid battery disposal legislation passed in 1989, opening up other lead-acid battery recycling opportunities that caused the public to shift away from using the HHW facilities for recycling.<sup>28</sup> The legislation created many requirements for sellers of automotive batteries and included a monetary incentive for recycling lead-acid batteries. With this legislation in Washington, the purchase price of a new lead-acid battery includes a deposit fee that can be refunded upon recycling a spent lead-acid battery. The refund is coordinated at retail locations and is not offered at the HHW facilities. This incentive program lifted pressure from public HHW facilities and made recycling hazardous lead-acid batteries more accessible and convenient.

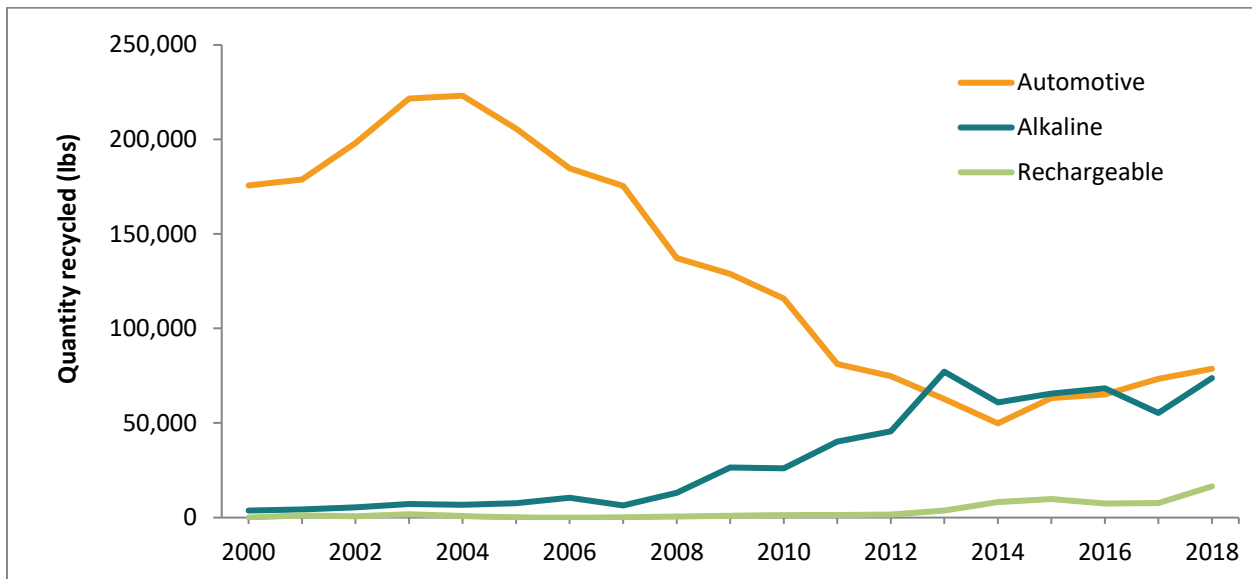


Figure 2: Quantities of automotive, alkaline and rechargeable household batteries recycled from 2000 to 2018 in pounds.

All batteries collected in the curbside recycling program are taken to West Van, where they are measured with batteries dropped off by residents at the HHW facility onsite. To determine quantities of batteries collected exclusively at the curb, CRC worked with Clark County Solid Waste and Environmental Outreach (SWEEO) to conduct a one-week case study in October 2019. During the study, CRC measured curbside battery quantities separately from self-hauled batteries and found that 3% of alkaline and rechargeable batteries were self-hauled to the HHW facility.

This is only an estimate of true collections because of the short duration of the study, but it provides a valuable snapshot of battery recycling. Using this data combined with 2018 totals from the additional HHW facilities provides an estimate of the proportion of recycled batteries that are collected in the curbside program. By weight, approximately 81% of recycled alkaline batteries were collected at the curb (Figure 3), along with 76% of rechargeable batteries (Figure 4). These findings suggest that residents rely on the curbside program to recycle their household batteries.

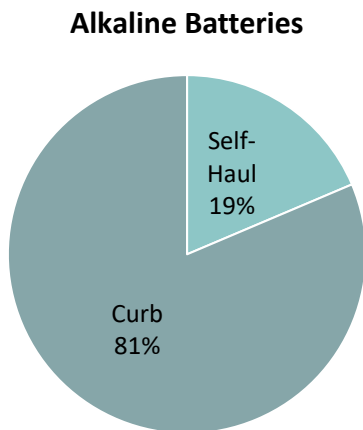


Figure 3: Estimated percentages of alkaline batteries collected at the curb and self-hauled by residents to Clark County HHW facilities.

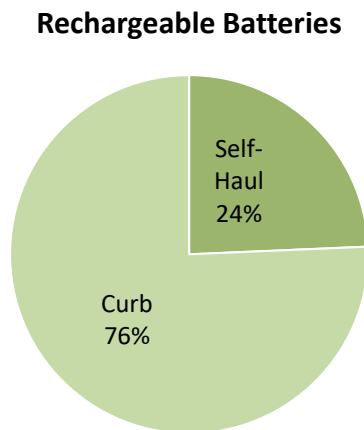


Figure 4: Estimated percentages of rechargeable batteries collected at the curb and self-hauled by residents to Clark County HHW facilities.

Data on battery contamination in mixed recycling or garbage carts is extremely limited though there are opportunities through ongoing recycling contamination studies. For example, SWEO conducts recycling residue studies to measure levels of contamination in residential mixed recycling, including measurements of batteries found in the recycling samples. Also, ongoing cart-tagging efforts by Waste Connections recycling advocates throughout Clark County will provide data and observations on batteries observed in residential curbside recycling.

## BATTERY HAZARDS

Fires are a growing concern in the recycling industry due to increased presence of lithium-ion and lithium-polymer batteries in the waste stream.<sup>25</sup> These batteries, most commonly referred to as lithium-ion batteries, are powerful rechargeable batteries used in laptops, cell phones, tablets, e-readers, portable chargers, smart watches, and other common electronics. They are at the center of recycling concerns because unlike single-use batteries, they are fragile and can start fires when damaged.<sup>25, 26</sup>



Hauling trucks and transfer stations offer perfect conditions for damaging batteries while handling tons of material daily, making fires likely when lithium-ion batteries are present. The fires are also difficult to extinguish because water intensifies lithium fires.<sup>8</sup> Lithium-ions are not formally collected in the curbside program because of this danger, but battery identification can be difficult, and residents unknowingly contaminate collections. Residents might also place batteries inside their recycling or garbage carts where damage is more likely. Recycling labels on batteries are another source of this confusion (Figure 5).



Figure 5: Recycling labels on lithium-ion batteries may cause disposal in recycling carts.<sup>25</sup>

Single-use batteries do not start fires in the same way as lithium-ion batteries, but they can ignite by other means. Single-use batteries like alkaline 6 and 9-volts have positive and negative connections on the same end of the battery, making it easy for both to make contact with metal and discharge electricity. This can cause ignition because a dead battery can contain up to 80% of the original charge.<sup>25</sup> As battery fires become the standard for the recycling industry, rates paid by customers may increase to cover costs from expected fire damages and injuries.

In recent years, local transfer stations and hauling trucks have experienced battery fires.<sup>15, 24</sup> In 2019, Waste Connections had ten fires in Clark County involving hot loads, causing thousands of dollars in damage and the loss of one truck. A “hot load” is an industry term for a hazardous material igniting after it was collected or compacted in a collection truck. The hazardous material could be batteries, fireworks, compressed fuel tanks or other volatile chemicals that residents should not put in their curbside carts. The exact cause of each fire is hard to determine but batteries are often suspected because, according to transfer station operators and managers, fires are occurring more frequently than they did in the past.

These local observations are supported by similar observations from Material Recovery Facility (MRF) operators and industry professionals nationwide. While data is limited, MRF operators across the U.S. and industry leaders from the Solid Waste Association of North America (SWANA) indicate the presence of more batteries in waste.<sup>26</sup> A California study found an average of 5.48 lithium-ion batteries per hour in the MRF recycling sort lines.<sup>26</sup> A 2017 survey of MRFs conducted by Resource Recycling Systems and South Bayside Waste Management Authority found that 50% of MRFs report increasing frequency of fires, and 64% found the most prevalent cause was from lithium-ion batteries.<sup>26</sup> A similar survey of waste facilities in 2018 supports these findings, as responses revealed 65% of fires at surveyed facilities from 2016-2018 were caused by batteries.<sup>3</sup> While other data is limited, the industry consensus is that batteries are causing more frequent, damaging fires.

Battery fires are not unique to the solid waste industry; manufacturers and transportation authorities have been adapting to battery dangers in recent years. For example, in 2018 the Department of Transportation created new requirements for handling and labeling shipments of new lithium-ion batteries.<sup>21</sup> Airlines have also created strict guidelines for transporting batteries

and battery-containing devices in response to incidents involving lithium-ion battery reactions in-flight.<sup>16</sup> Similar restrictions exist internationally and are all clearly responses to battery fires, though U.S. recycling operations have been slower to respond.

Call2Recycle Inc., formerly known as the Rechargeable Battery Recycling Corporation (RBRC), has been one of the major voices for change in battery recycling and is widely accepted as a leader in the industry. Call2Recycle is an organization that provides fee-based boxes and barrels for customers to recycle batteries by mail throughout North America.<sup>C</sup> Fire is a concern for all battery recyclers and caused Call2Recycle to add flame retardant liners to their recycling boxes in 2019.<sup>4</sup> Because of fire danger, Call2Recycle frequently recommends keeping batteries out of curbside programs, and CEO and President of Call2Recycle, Carl Smith, described in a 2018 Environmental Protection Agency (EPA) webinar that “curbside is seldom wise.”<sup>25</sup>

In addition to fire hazards, batteries pose risks to human health from their hazardous components. The cobalt and nickel compounds found in lithium-ion batteries are toxic and can have adverse respiratory, pulmonary and neurological effects on anyone exposed.<sup>1</sup> Alkaline batteries have fewer risks to human health and do not contain mercury, but they are prone to corrosion and leaks that can irritate skin and leach basic compounds into the environment when improperly disposed. If household batteries are exposed to water, they corrode and leak electrolyte. Due to their hazards, batteries require special recycling, though it is logistically challenging to collect residential batteries on a large-scale.

## COLLECTION LOGISTICS

In addition to fire and health hazards, collecting batteries at the curb is logistically challenging and puts recycling route drivers at risk. Clark County’s curbside battery recycling relies greatly on the drivers seeing batteries on the recycling carts from within the truck. Recycling trucks use automated collection equipment to empty carts without needing the driver to exit the vehicle. As a result, the driver can miss the batteries, causing them to fall onto the ground or in with the mixed recycling when the cart is emptied into the truck. Collecting batteries on mixed recycling lids in this way allows room for error, and places a burden on the driver who is already navigating many dynamics.

An important factor for waste collections is to minimize the number of times the driver must exit and enter the truck. According to the United States Department of Labor, “collection is one of the most dangerous activities in the recycling industry.”<sup>18</sup> Refuse and recyclable material collectors had the fifth most fatalities by occupation in the U.S. in 2018.<sup>27</sup> Garbage and recycling route drivers are most at risk when they exit their vehicle where they can be injured by their own vehicle, traffic, or exposure to hazardous materials. Clark County recycling drivers must exit their trucks when they encounter batteries, motor oil, antifreeze and glass, putting them at risk for each material they must collect manually.

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<sup>C</sup> Visit [call2recycle.org](https://call2recycle.org) for more information.

Another difficult part of curbside battery collections is that the recycling trucks are not well-equipped to transport batteries. Recycling drivers place bags of batteries into the trays on the sides of the truck that were designed to store gallon jugs of used oil. In this tray, the batteries are often exposed to rain, and many of the battery bags become filled with water. Water can seep into batteries, especially if they are damaged, dented or corroded, mixing with the battery electrolyte. This creates a hazardous slurry of wet batteries that the recycling driver must sort by hand. Also during transport, the batteries can escape their bags and become loose in the tray, creating safety hazards if lithium-ion batteries are battered while the truck is in motion.

When collecting materials at the curb, it is challenging for drivers to avoid collecting non-program batteries or electronics that residents include with their household batteries at the curb. The curbside battery collections become contaminated with electronics, lithium-ion batteries, lead-acid batteries, cords, and miscellaneous devices that are difficult to identify before sorting everything at West Van. Recycling drivers can tag and reject non-program items at the curb, but identifying contamination within bags of household batteries is challenging, so contaminants are commonly transported to West Van where they are placed into bulk containers meant for household batteries.

The process of sorting and bulking batteries at West Van creates conditions that could result in battery fires. At the transfer station, recycling drivers work quickly to toss or drop batteries into two bulk containers: alkaline batteries and all other batteries. Contamination from curbside battery collections, such as the lithium-ion batteries, lead-acid batteries and electronics, are all tossed into the “other” battery container with the household rechargeable batteries. This mix of batteries being tossed together could cause damage to lithium-ion batteries and start fires. Battery fires have not yet occurred in this bulking enclosure at West Van, but a fire would be especially dangerous in this setting because the enclosure is not staffed and is located in a secluded area of the transfer station that can go unobserved for long periods of time.

## RECYCLING ACCESSIBILITY

Batteries are a unique hazardous waste because unlike many other hazardous substances that are specific to different hobbies or industries, batteries are used by everyone, and all consumers need access to convenient recycling options. Clark County’s curbside battery recycling program is only available for single-family homes, so multi-family residents do not have access to curbside battery recycling. These residents are directed to bring their batteries to HHW facilities or limited retail locations, and this makes battery recycling inconvenient and likely results in improper disposal. Residents in apartments have limited options, and those relying on public transit have even fewer options because they cannot access the HHW facilities without a vehicle.

Private companies like Home Depot and Lowes work with Call2Recycle to offer free recycling of cell phones and rechargeable batteries in their stores. There are several private locations in Clark County that accept these types of batteries, though they do not accept single-use or alkaline

batteries. HHW facilities at the transfer stations accept most battery types, but only during limited hours of operation. The resulting mix of private and public collections of batteries with varying rules and restrictions makes recycling batteries, especially lithium-ion batteries, confusing and prohibitive for consumers.

Clark County has higher accessibility to battery recycling than many areas in Washington because of curbside battery collection at single-family homes. Outside of the county, only the cities of Seattle, Spokane and Tacoma have curbside battery collection with varying rules. For example, Seattle requires curbside pick-ups of household batteries to be scheduled ahead of time by the resident and charges a \$5 fee per pick-up.<sup>27</sup> For the single \$5 fee, Seattle residents can also recycle CFL light bulbs in the same pick-up. Seattle's program is especially unique because it is also available to residents of multifamily homes. Collections in Tacoma and Spokane are more similar to Clark County's methods, though Tacoma residents place the bagged batteries in their glass cart instead of on top of their mixed recycling cart lid.

Accessibility to battery recycling is essential, though managing large quantities of batteries can be challenging at West Van. Stericycle, the contracted hazardous material company that handles HHW at the transfer stations, has had difficulty with the large quantities of household batteries that are collected in the curbside program. Stericycle has occasionally been unable to remove batteries to send them to their final recycling destinations due to the high volumes, causing large amounts to stockpile at West Van, nearly exceeding the transfer station's capacity for batteries. This has required CRC to alter their facility to accommodate larger quantities of batteries, though this is difficult within the current structure of the transfer station and could be overwhelmed as battery use continues to increase.

## OUTREACH AND EDUCATION

Educating the public about battery safety and recycling practices is important to improve recycling and garbage collections. Battery recycling is a challenging subject for solid waste educators because there are many diverse battery types and electronics that require different handling, and technology changes rapidly. Curbside battery collections are frequently contaminated with non-program batteries, electronics and miscellaneous items. Educating residents on the correct types of batteries to place on their recycling cart lids is an essential part to improving battery collections.

High powered lithium-ion and lithium-polymer batteries have become common in the past decade, though battery recycling messages have not changed to address them. Curbside collections are meant for "household batteries," which was a term that was developed before lithium-ion and other high-tech batteries were common. Today there are many more battery types in households, not all of which are technically "household batteries," making this term outdated for use in public outreach. This problem will only grow because battery technology is evolving, and battery

manufacturers have begun to develop household sizes of lithium-ion batteries that will add further confusion.

Clark County Green Neighbors is a SWEO program to connect with residents about recycling and waste reduction.<sup>D</sup> In recent years Green Neighbors has worked with Waste Connections and the City of Vancouver to publish various blog articles, RecycleRight app reminders and social media posts about battery recycling to maximize outreach in the community. The Clark County Public Health Facebook page published a series of battery safety posts in 2019, and the posts gained interest from the community. One such post was the page's most popular post for the month and reached close to 10,000 people. There are opportunities through Clark County programs and these regional partnerships to continue and expand outreach on battery and electronics recycling, and to update messaging describing household batteries.

## ENVIRONMENTAL IMPACTS

Modern alkaline batteries do not contain mercury and are considered non-hazardous by the federal government and most states. In Washington, residential sources of alkaline batteries are not required to be handled as HHW, and quantities produced by residents are considered safe in regular municipal solid waste landfills. Based on online recycling guides from counties throughout Washington, approximately twenty counties in the state instruct residents to put alkaline batteries in the garbage and do not accept them for recycling.

Several of the counties that accept alkaline batteries for recycling also have outreach to explain that they can go in the garbage. Clark County does not encourage residents to throw alkaline batteries in the garbage. Though few counties recycle alkaline batteries, recycling is environmentally preferable to landfilling because recycled batteries can be used to manufacture new batteries.<sup>19, 25</sup> Recycling reduces the need for virgin metals, and increases the lifespan of non-renewable materials used to make batteries.<sup>19</sup>

Rechargeable batteries are considered Universal Waste in Washington and are required to be recycled or handled as hazardous waste. Household sizes of rechargeable batteries contain hazardous components including nickel, zinc, manganese, cadmium, lithium hydroxide, potassium hydroxide and other chemistries.<sup>9</sup> These materials are dangerous and can cause pollution, so they are not safe for disposal in regular municipal solid waste landfills.

In Clark County, both rechargeable and alkaline battery types are accepted for recycling at the HHW facilities and are sent to various U.S. manufacturers, smelters and battery recycling facilities. Recycling batteries domestically is beneficial because U.S. manufacturing and recycling facilities use safety practices that protect workers and the environment from the hazardous components in batteries, which is less common in overseas recycling operations.<sup>14</sup>

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<sup>D</sup> Visit [clarkgreenneighbors.org](http://clarkgreenneighbors.org) for more information.

## RESPONSE OPTIONS

The following describes ten methods that could be applied to Clark County's battery collections to improve recycling and reduce hazards. Clark County will work with partners to determine the best approach to use and determine next steps to carry out any changes to operations and outreach. Priority response options have been identified based on immediate safety concerns and/or relative ease of implementation.

### **1. (Priority) Formally ban lithium-ion and lithium-polymer batteries from curbside collections.**

Residents are directed to self-haul lithium-ion and lithium-polymer batteries to recycling locations, but many residents still place them with their curbside household battery recycling or inside their mixed recycling or garbage carts. Because of their high risk of becoming damaged in these settings, lithium-ion and lithium-polymer batteries should be prohibited from the curb. Banning lithium-ion type batteries would set a clear standard to keep these items out of curbside garbage and recycling, as is the requirement for other dangerous materials like propane tanks and light bulbs containing mercury. This option would need to be accompanied by an outreach campaign to get the message out to the public with clear directions on where they can recycle these batteries.

### **2. (Priority) Add battery storage to collection trucks if continuing curbside collections.**

Currently, recycling drivers must transport curbside batteries in the uncovered oil and antifreeze trays on the sides of the collection truck. This exposes the batteries to rain, oil and antifreeze, and makes it possible for them to bounce out of the tray, becoming litter. Creating covered storage for batteries that is separate from the oil and antifreeze trays, and out of the truck cab, would improve battery transport. This would be an additional expense to the hauler and could reflect in higher recycling rates to Clark County customers.

### **3. (Priority) Modify battery sorting at the transfer stations.**

Practice additional sorting for batteries at the transfer stations to reduce fire risks from lithium-ion batteries. This report recommends sorting batteries into four categories: alkaline, lithium-ion/lithium-polymer, lead acid, and "other" rechargeable batteries. This would require two additional containers or trays for sorting at the existing areas at the transfer stations, and staff would need training on battery identification. Also, use of personal protective equipment while sorting batteries could be improved by supplying disposable gloves at the battery sorting stations. Disposable gloves will protect recycling drivers from exposure to caustic or acidic materials.

#### **4. Provide recycling drivers with educational tools.**

There is opportunity to provide educational tools to the customer when recycling drivers encounter non-program or improperly packaged batteries. Taping batteries is known to prevent the accidental discharge of electricity, and damaged batteries can leak and cause harm. Tagging carts and rejecting batteries that are damaged or not taped would be effective at encouraging behavior change. To use this method, tags or educational flyers specific to batteries would need to be developed, and the drivers and recycling advocates would need training to ensure consistent messages reach customers.

Due to battery diversity and challenges with contamination, it is important that the recycling drivers know what is accepted at the curb and what should be rejected so they can reduce the amount of contamination being collected. Waste Connections recycling drivers would need detailed training in battery identification to ensure non-program batteries and electronics are tagged and left at the curb, especially lithium-ions. While battery identification training for recycling drivers could help improve collections, it is important to have other tools to reduce contamination. The burden should not be placed entirely on the recycling drivers because battery identification is challenging, especially in curbside recycling settings.

#### **5. Create and implement an outreach campaign on battery recycling.**

The development of a battery recycling outreach campaign would be valuable throughout the community. The outreach messages that SWEO and regional partners currently use for battery recycling could be used as the base of a larger Green Neighbors campaign to teach residents the dangers of batteries, how to use batteries sustainably, and how to recycle batteries correctly. Such a campaign could include brochure distributions, social media advertisements, newspaper advertisements, tabling at community events, teaching at recycling classes, and more. For outreach to be successful, current outreach messages and websites need to be updated and simplified. Eliminating the “household” battery term and developing new outreach messaging would help reduce public confusion surrounding battery recycling.

Educating the public about battery purchasing, maintenance and recycling would also have a positive impact. This could be accomplished through SWEO-lead training in multiple forums for residents. Clark County’s Master Composter Recycler training and the City of Vancouver’s RecycleU trainings are opportunities to educate community members about in-depth recycling topics such as battery recycling.<sup>E</sup> Recycling educators from the contracted recycling hauler could also be tasked with providing education on battery waste reduction and recycling. Additionally, training recycling drivers and recycling advocates in battery identification would be valuable to maintain safe curbside collections and minimize the spread of misinformation in their interactions with the public.

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<sup>E</sup> Visit [clarkcountycomposts.org](http://clarkcountycomposts.org) and [cityofvancouver.us/recycleu](http://cityofvancouver.us/recycleu) for more information.

## **6. Develop an alternative curbside battery collection program.**

Requiring residents to schedule their battery recycling and possibly pay a small fee for pick-up would facilitate a more organized collection and would eliminate the guesswork currently required of the recycling route drivers. Collecting batteries from residential carts would become less reliant on the drivers seeing them on the lid by chance, and would instead give the drivers exact locations where they will need to collect batteries. Waste Connections drivers use tablets throughout their routes, and updating the tablets to include battery pick-up locations would be valuable and is worth exploring. This method would maintain the convenience of curbside collection, likely preventing residents from throwing batteries away in their garbage.

This model would likely make it safer to accept lithium-ion and other non-household batteries at the curb because there would be direct communication between the resident and the recycling company when scheduling the battery pick-up. The customer service connection would provide an outreach opportunity to communicate safe battery practices. Attaching a small fee to the pick-up formalizes the process, and makes everyone involved more mindful of the rules. This model is currently being used in Seattle, Washington, where residents are told to place batteries into a cardboard box next to their garbage cart and are charged \$5 per pick-up.<sup>23</sup>

Altering Clark County's existing curbside collection in this manner would maintain the convenience factor of curbside battery pick-up, but with more organized methods that hold residents accountable for how they manage their batteries. This model could likely be achieved with or without the fee attached. To maintain consistency, it would be logical to apply the same changes to curbside collections of used motor oil and antifreeze. It would also be important to train all customer service representatives in battery technology so they can answer questions about battery recycling and provide consistent messages to the public. Training could be organized through collaborations between Clark County SWEO and Waste Connections.

## **7. Implement a multi-location battery recycling program.**

A battery drop-off program could be modeled after Clark County's Paint Take-Back program where paint stores voluntarily participate to collect unused paint from residents. Paint is transported from each store by a licensed hazardous waste transportation hauler through a contract with the county, and transport is funded by a grant from the Washington Department of Ecology. Paint disposal fees are paid by the county's contracted HHW facility operator, Columbia Resource Company. Because batteries are classified as Universal Waste, easier collection options such as mail-in recycling boxes at satellite sites would also be an option. The Paint Take-Back program is coordinated by SWEO operations staff, so there is potential for county staff to coordinate a similar battery drop-off program. Alternatively, management of such a program could be included in contract negotiations as a requirement for the recycling hauler to develop, fund and coordinate.



Municipalities, public agencies, police departments, public libraries, retail stores, apartment lobbies and more could all potentially serve as drop-off locations for residential batteries. These satellite collections would be smaller and more organized than the current curbside system, making it easier to inspect and identify improperly packaged batteries and contamination. Drop-off locations would also provide convenient places to provide recycling outreach materials on topics such as HHW management and electronics recycling. Having a variety of location types would make battery recycling more accessible to different populations, and would particularly benefit residents that rely on public transportation or live in multi-family complexes.

Using a drop-off system would simplify battery recycling because identifying the battery type would not be as important as it is for curbside collections, and it would streamline the currently confusing system of recycling different types of batteries at different locations. King County in Washington has had a successful drop-off battery program since 2003 by working with Call2Recycle to distribute rechargeable battery and cell phone boxes in public areas.<sup>5</sup> Pursuing a similar system that includes alkaline batteries would be ideal for Clark County to capture the large quantities of alkaline batteries used by residents (Figure 2).

A concern with developing a battery drop-off system is the risk of fire at satellite collections. In October 2019, a battery collection barrel at a Minneapolis library caught fire from a vaping device, causing Hennepin County to remove battery collections from community sites.<sup>20</sup> Vaping pens are an emerging waste that do not fit into battery recycling systems because they contain batteries, nicotine and ignition mechanisms which can serve as the spark that starts battery fires. Contaminants such as vaping pens, damaged batteries or other electronics could endanger collections, so regular inspections of satellite collections would be essential.

To prevent fires in satellite collections, it would be beneficial for collection boxes to be only accessible by the site's employees. The public would need to hand their batteries to an employee, which is similar to how the Paint Take-Back program operates in stores. Training employees to accept the correct batteries and package them safely would be ideal for preventing harm. However, if boxes are left to be managed entirely by the sites' employees, safety concerns may arise. Hiring trained professionals to conduct regular inspections throughout satellite collections would be important for reducing risk.

## **8. End curbside battery recycling and prohibit batteries from all curbside collections.**

Prohibiting batteries at the curb makes a clear statement that they cannot go into garbage or recycling bins, which is the requirement for many other types of HHW including common items like compact fluorescent light bulbs and electronics. Removing batteries from curbside collections in Clark County would require widespread outreach and a gradual transition into a battery drop-off program.

A concern surrounding battery recycling is that improper disposal of batteries may become more common without the convenience of a curbside battery recycling service. This is a valid concern

and is difficult to predict or measure. Other solid waste jurisdictions throughout the U.S. that do not accept batteries at the curb still experience battery fires in their trucks and facilities, though they actively try to educate the public to keep batteries out. No large-scale studies have been made on the subject, so it is important for solid waste professionals to realize that an abrupt curbside change may not be effective without enforcement and persistent education.

Based on the limited availability of data and observations on curbside battery bans, it may be worthwhile to first attempt the other options in this report before removing curbside battery recycling collections. A sudden curbside ban would be a distinct change within Clark County and would likely disrupt residents that rely on the program. If the other options in this report are used and found ineffective at reducing fires or contamination, ending curbside battery collections would be the final step to prevent harm and eliminate the challenges currently caused by curbside recycling collections.

#### **9. Provide residents with branded tape and bags or boxes to use for battery recycling.**

Providing packaging supplies would encourage residents to tape their batteries and could prevent unsafe disposal. Bags or tape could be branded with recycling instructions, links to online resources and contact information. Thoughtfully branding these materials and distributing them would be a creative opportunity for battery outreach. Providing these materials at drop-off locations would be beneficial if using the satellite collection system described in option 7.

#### **10. Support battery product stewardship in Washington.**

Product stewardship is a policy which ensures that all those involved in the lifecycle of a product share responsibility for reducing its health and environmental impacts.<sup>6</sup> Existing stewardship programs in Washington, such as E-Cycle Washington and Light Recycle Washington, have been effective at reducing impacts of those hazardous wastes.<sup>F</sup> If battery stewardship is pursued in Washington, Clark County should express support to the state legislature.

Existing battery stewardship programs including those operating throughout British Columbia, Manitoba, Ontario and Quebec use Extended Producer Responsibility (EPR) models. EPR is a mandatory type of product stewardship that requires manufacturers to manage the post-consumer disposal or recycling of the product.<sup>6</sup> This provides these regions with a universal program for battery recycling that increases accessibility to all battery consumers.

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<sup>F</sup> Visit [ecology.wa.gov](http://ecology.wa.gov) for more information.

## CONCLUSION

Battery fires are impacting recycling collections across the U.S. and it is up to regional solid waste leaders to adapt to this problem to keep employees and the community safe. Batteries are a common hazardous waste with many potential environmental and health impacts, and therefore need to be recycled through safe and sustainable practices. This report offers ten options for improving residential battery recycling through public education, new collection strategies and improved recycling accessibility. The response options vary in difficulty and can be gradually introduced before moving toward larger system changes.

Any changes made to recycling programs will require support from outreach staff to ensure effective and positive communications with the public. Before implementing changes, it would be beneficial to get input from Clark County's Solid Waste Advisory Commission, or to organize a public survey for residents to provide feedback. Clark County will work with regional partners and stakeholders to decide on recommended changes to the recycling system, and recommendations will align closely with updates to the Clark County Solid Waste Management Plan and recycling contracts as applicable.

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