

HOUSEHOLD BATTERY COLLECTION

How dangerous are small household batteries in your landfill? Like most environmental risk questions, that depends on a number of factors:



Source: USEPA at www.epa.gov/epaoswer/non-hw/muncpl/battery.htm

Factor # 1: Which metal?

One factor is which chemical/metal that the battery contains. Since 1996, mercury has been phased out of most small batteries *made in the U.S.* (and Canada as well). Because the metals that are present are not considered to be highly toxic, **Carbon-Zinc and "non-button" Alkaline batteries aren't even officially considered hazardous wastes** anymore. Regular alkaline batteries are the most common household battery and include AA, AAA, C, D, 9 volt, and lantern type batteries. Note though, just because a battery looks like, or is an AA (or other), it doesn't mean that it is definitely alkaline. You have to look at the packaging or label. And if you burn your wastes, even alkalines will still emit heavy metals into the smoke.

In contrast, **Button cell batteries still contain mercury**. Button cell batteries may be alkaline, silver oxide, or zinc air, and all types contain significant amounts of mercury. Mercuric oxide batteries, which contain by far the most mercury, can come in different shapes and sizes, but are now mostly for industrial and medical use.



Then **Nickel-Cadmium (NiCad), Lithium Ion, and Small Sealed Lead batteries (SSL's)** also contain metals that can be very harmful to the health of humans and wildlife. Cadmium, lithium, lead, and mercury are all toxic metals. These metals are in batteries for watches, cameras, calculators, hearing aids, electronic greeting cards, clocks, electronic games, motorized toys, etc. Some rechargeable NiCads are the same shape, and are meant to be used as regular AA, AAA, C, D, etc. batteries.

Some sealed lead batteries may look like alkaline 6 or 9-volt batteries and NiCad's can look like regular alkalines, but they are very different because their contents are much more toxic. Some cell-phone and other hi-tech electronic batteries still contain mercury. But these batteries, regardless of where they are made, are required to include instructions and contact information about where to recycle or dispose them.



An example of NiCad rechargeable "AA" batteries

How Can You Tell What The Battery Is?

The Battery Act of 1996 requires U.S.-made Ni-Cad and most small sealed lead batteries to be labeled. Remember, **all button batteries have mercury**, so you don't need to strain your eyes! Canadian batteries should be labeled as well, either on the battery or consumer package. Labeling for other foreign batteries varies. Beware that many are more likely to contain mercury or other toxic metals.

Factor #2: Landfill practices

What happens to the trash after it reaches the dump is another factor to consider. If you have an unlined dump (which most Villages do), those chemicals have a potential for migrating outside your dump and into your environment. If your community wastes are burned, the likelihood of those metals reaching beyond the dumpsite (in the smoke) is very high. In a Lower 48 study, it was estimated that **35 percent of all background local-source mercury comes from incinerating batteries** with household garbage.



Factor #3: Quantity

Another factor to consider is the quantity that is being generated—**how much toxic metal can potentially get into the water, air, and food chain?** We don't know the exact contribution of each battery-type to a Village waste stream. But we can tell you the **national average of used household battery generation each year is about 2 lbs per household**. We haven't heard of any detailed Village counts so we don't know if Villages average more or less. Most of the weight of those batteries are probably regular alkaline batteries. Some batteries have toxic metals, but in a very, very small amount. This doesn't mean that you shouldn't recycle them, but it does mean that it is okay to take some time to build up a program where they are all sent out of the Village.



Button cell batteries.
Source: Environment Canada at www.ec.gc.ca/MERCURY/SM/EN/sm-mcp.cfm?SELECT=SM

Factor #4: Comparison of where you will do the most good

When you think about quantity, it is good to consider the particular metal amount compared with other sources of these metals. For example, **getting all vehicle and large emergency power lead-acid batteries out of the dump and waters** (i.e. marine batteries discarded in the River) **will reduce lead in your environment more than collecting all of the household batteries** containing lead. An annual Village average for vehicle lead-acid batteries is about 10 to 15 lbs per person, and of that weight, most of it is very harmful (either lead or acid). To read about some other village household waste lead sources, see our other lead sources handout at <http://zendergroup.org/docs/Lead.pdf> further below.



With mercury, there is a slightly different story. Mercury is also a very harmful metal, especially if it changes to its most toxic form, called "methylmercury". It can hurt brain development in children and affect neurological ability in adults (e.g. being able to move well and remember or understand things). There can be many sources of mercury in the community.

Mercury switches in and old thermometers are of particular concern as they are **much, much**

higher in mercury than batteries, even though they may not be discarded as often. See our "Local mercury sources" handout at <http://zendergroup.org/docs/Mercury.pdf> to decide if you can start a separation program for high-mercury containing waste types.

Regardless of their mercury content, two of the easiest and most common mercury sources to do something about in regular Village trash are **fluorescent lights and button cell batteries**. In regular *household* trash, most of the mercury these days is from button cell batteries. Button cell batteries don't weigh much, and last a fair amount of time, but they can contain about 25 mg of mercury each. So collecting button cell batteries can significantly reduce the amount of local-sourced household mercury in your environment. Older hearing aid and watch batteries are particularly high in mercury.

In comparison, new 4-foot fluorescent lights (like in the school and office buildings) contain about 20 mg of mercury, and compact fluorescent bulbs about 4 to 8 mgs of mercury. Older fluorescent 4-foot lights contain closer to 80 mg of mercury. The large fluorescent lights aren't counted as household trash, so we can't tell you exactly how much mercury these lights contribute to your wastestream compared with button cells. Finding this out would require you to conduct a business/office/school survey.



However, collecting and **recycling most of the fluorescent lights is easier** than collecting and recycling most of the button cells. With fluorescent lights, the main source will be the businesses (and school). In most Villages, there are not very many businesses. And the lights are easier to keep track of. There are Alaska companies who will send you pre-labeled boxes to recycle fluorescent lights for a reasonable fee, or you can use your old boxes and label those. **The older lights have PCBs** as well as higher levels of mercury. So going to each business to make sure that they send back their lights is an effort well-spent. See <http://www.ccthitaw.org/pdf/fluorescent.pdf> for "how-to" steps.



With button cell batteries, a lot of education is needed to get participation. Most households will not like separating out such tiny batteries and bringing them to a collection office, or saving them at home. You might first need to educate them about the very harmful effects of mercury to subsistence and children and elders. It will be a long-term process to convince people to store their used batteries, but worth it for subsistence and community health.

Factor #5: Chemistry and Hydrology

Another factor is the "chemistry" of your lands and waters at the dump and in the surrounding environment. Natural chemistry processes can change the metal into one or more different "forms". Depending on which form, it can be very dangerous -- or not considered harmful. For example, in many



wetland soils, most heavy metals (including mercury and lead) bind up with the chemical sulfur to form a "harmless" black compound. That process happens deep in the soil where there is no oxygen. If heavy metals migrate down through these wetland soils (or the dump is located there), they can stay there unless they are disturbed.

One such disturbance can be turbulent (i.e. rough, eroding) flooding or flushing, or any event that brings oxygen (air) to the subsurface, such as digging or permafrost degradation. Another consideration in determining the potential for harm from dumpsite metals is the acidity of your soil and waters. In general, more acid will leach the metals out, and they will have a greater tendency to go through most soils into your waters. That is one of the reasons that wet-cell, or "lead-acid" batteries are so important to keep out of the environment. They come with a ready-made supply of acid to "help" get the lead into your waters. More acidic water in a stream can likewise bring out metals that normally would stay in the sediment. Note that the sulfuric acid in batteries is the same chemical that is formed when you have high-sulfur in your soils, and they are disturbed by digging, flushing, etc.

Factor #6: Exposure



Still another very important factor is the potential for exposure. We mentioned smoke already. Does the smoke blow right into town or onto drying racks? Are there fish camps just downstream of the dump? Are berries collected where the dump drains? Exposure equations require very advanced level math. For example, they involve calculating the phase and form of the metal. **How much of it goes to the air, soil, and water, and how much of that is a toxic form? How long is a person/animal exposed? How does the metal get into the body (breathing, eating, skin absorption), and what is the activity level and breathing rate of the individual or animal or plant, and what is their body size?**



The above was simplifying some of the processes mentioned. Exposure is very complicated in terms of calculating the numbers, but it is common sense too—**the more you're exposed to a harmful contaminant, the more likely that your health can be affected.**

The Bottom Line On Household Battery Collection

If you have time (or can find volunteers or write a grant to get the time), definitely **start a household battery collection program.** It won't take much time or money, and **will remove a significant amount of local-source mercury out of your environment.** A program is especially important if you **burn your wastes or your dump is flooded each year.** A program might be difficult to get a lot of participation, but it is **easy to start.** Collect the batteries in non-cracked plastic bottles or a 5-gal bucket in a dry space. **Do not mix the batteries with other objects such as metal keys or coin change since this can short circuit the battery, causing heat and sparks.**



Because rechargeable batteries are possible to recycle for free, it might be useful to **separate them**. Also, not all battery recycle companies take button batteries, because of their mercury content, so these should be placed in a separate bottle if possible, as well. It is up to you whether you want to include regular alkaline batteries in your program. They will take up more office space. But on the other hand, people might get confused about what batteries they should recycle, or **they might have old batteries, or Alkaline batteries from foreign countries that allow mercury**. It might be best to **accept all batteries**. If your space is limited, you can always go through and throw out the post-1996, made-in-U.S., Alkaline and Carbon-Zinc batteries later.

- ❖ Ideally, **no batteries should be thrown into trash that will be burned, but Alkaline and Carbon-Zinc are still safest**. If you run out of office room, find an unused storage space until you are able to find the funds and time to recycle.
- ❖ **Almost all batteries made before 1996 contain mercury**, even regular Alkaline batteries. It might be a good idea to post flyers about this fact for Spring Cleanup.

- ❖ **Check that your store carries batteries manufactured in the U.S. or Canada**. If they are made elsewhere, there is a decent chance that they contain mercury still. Work with your store to switch to a different distributor, or to offer residents a choice. You can make a little sign in the store by the batteries that let people know why the price difference makes a difference in their environment, and to publicize your collection program.



- ❖ **Work with your clinic** to make sure that any **mercuric oxide batteries** are **not** disposed at the dump, and mercury thermometers and blood pressure cuffs are sent out. Medical equipment is the primary use now for mercuric oxide batteries, which are like multiple button cell batteries in one, and thus **contain a very high level of mercury** compared to other batteries.

- ❖ While you won't find a lot of them, be on the look-out for older, pre-1996 or foreign-made **household mercuric oxide batteries**. These are most important household batteries to take out of your waste stream. Look also for old mercury thermometers while you are at. You can collect these along with your batteries, but because they are glass, you will need to cushion them carefully and store them separately. Follow the information from websites listed on page 7, in case of breakage.



- ❖ If people still want to dump their batteries in the landfill (or your office is running out of space), ask them to first put their batteries into closed, non-cracked plastic bottles. Those of us living here know that the plastic bottles will tend to crack sooner than later. You can try triple-bagging the batteries instead. Try a **container left at the dump** for

people to drop their battery filled bags and bottles. **A lidded garbage pail or 5 gallon bucket** should work fine for this purpose. This will be especially important if you burn at the dump. The batteries should not be burned after all the trouble people went to, to separate them. You might wish to have children paint the container with messages and pictures so that people will be careful in using it only for household batteries. You can teach children at school why the pail is there. Replace the pail if it gets cracked.

Funding

There are places to recycle many household batteries, but you will likely need to pay for postage at least. However, **postage for sending household batteries and fluorescent lights back can be covered through IGAP funds** because it is a solid waste activity.

Alternatives To Mercury-Containing Household Batteries

Rechargeable batteries are less wasteful because they can be used over and over again. But they are also more toxic. There *are new rechargeable Alkaline* batteries that **do not contain cadmium**. These should be promoted as much as possible. Solar batteries (the solar panel can recharge the batteries, or directly supply power) are also becoming more and more affordable.

Purchasing and distributing Alkaline rechargeable batteries and solar battery chargers are something that could be part of an IGAP demonstration project-- to reduce household hazardous wastes. Type in "rechargeable alkaline" or "solar charger" into your internet search engine for places with. See www.realgoods.com for one place to order these types of batteries and solar chargers.

Where Can I Recycle My Household Batteries?

Total Reclaim in Anchorage accepts most kinds of household batteries and will help you with your shipping and packing questions. They accept:

- Alkaline
- Rechargeable Alkaline
- Nickel-Cadmium
- Nickel Metal Hydride
- Lithium
- Lithium-ion
- Carbon-Zinc
- Zinc-air
- Silver oxide

They do not accept mercuric oxide batteries or small sealed lead batteries. For mercuric oxide button batteries, try Mercury Solutions below. For Small sealed lead batteries, you might ask whether your normal lead-acid battery recycler will take these. Otherwise, call the companies listed below the table, or bring in to the Anchorage Landfill.

Total Reclaim is partnering with the **Greenstar E-recycling Program** to provide backhaul shipping reimbursement- you can then offer to local shipping partners to cover their extra costs, or keep it to cover your costs. If you ship to them, Total Reclaim will help you with this process. This is a **Rasmuson Foundation** Funded Program: <http://www.greenstarinc.org/electronicsinfo.php>

- Green Star reimburses non-profit organizations and Tribes with a 501(c)(3) determination letter.

Reimbursement schedule is as follows:

1 July 2007 - 30 June 2008: 25¢ per pound

1 July 2008 - 30 June 2009: 20¢ per pound

Additional Locations for Rechargeable batteries: These can be recycled through RBRC. See www.rbrc.org or call 1-800-9-BATTERY. A good resource on their site that we like is the Battery Lesson Plan. You can link to it from their home page. It includes lots of information about the makeup of household batteries, as well as an actual lesson plan for schools and community.

Several Radio Shack stores accept NiCad batteries and other rechargeable batteries, including stores in Anchorage, Wasilla, Eagle River, Soldotna, and Kenai. Call first to make sure you have the right kind of batteries, and that the particular store accepts them. The 5th Ave Mall Radio Shack in Anchorage doesn't accept batteries, but the ones at 500 E. Benson (258-9050), 210 Muldoon Rd (337-2100) and 9220 Lake Otis Pkwy (644-8313) do. **Batteries Plus** at 910 West International Airport Road (770-6110) also accepts rechargeables. **Best Buy** at the Dimond Mall accepts batteries and cell phones. Still, for all stores, **call first** to be sure that their current policy hasn't changed.



NiCad 7.2 volt battery

Additional Locations for Non-rechargeable batteries: The **Anchorage Landfill Hazardous Waste Facility** accepts up to 40 lbs of **all types of household batteries** from residents each day. That is a lot of household batteries. If you have any relatives in Anchorage, consider bringing a small plastic bottle of button cells as a "gift" the next time you are at a conference. Besides bringing in-person any household battery to the Anchorage Hazardous Waste Facility, or your rechargeable batteries to a Radio Shack store or Best Buy, you'll likely need to **post them via mail-in programs**.



Non-rechargeable lithium battery

To find locations to post your non-rechargeable (and rechargeable) batteries, Go to the "Earth 911 Organization" link at <http://alaska.earth911.org/master.asp> Click on "battery recycling" to the left, or go directly to

<http://alaska.earth911.org/usa/master.asp?newpostal=99501&s=ls&serviceid=126>

Mail-in programs for non-rechargeable batteries: Mail-in programs can vary a little bit.

For example, some may accept credit cards and some may not. Costs can vary some as well. In addition to batteries, some companies, such as Total Reclaim, might recycle other materials, like fluorescent lights and other mercury-containing materials. It is good to call a couple of companies with your specific needs and questions (for example, will you be recycling all household batteries together, or just button cells?). You might be able to see who would be best to work with, just by speaking with them. Just like people, some companies are easier and nicer.



Most Mail-in programs operate like this:

1. Order a prepaid container through the company.
2. They will ship you the container.
3. All labels and proper documentation are included.
4. Once filled, just call the company to have the box shipped back.
5. The company will recycle the batteries.
6. They will then send a Certificate of Recycling. Keep this for your records. You can include a copy in your grant reports.

Total Reclaim in Anchorage does not send out containers as it adds to cost of the program. They will assist you to label your own container - such as a 5 gallon bucket.

Cost: Cost will change depending on the "metals market" and shipping costs. The metals market means how much that company can make by selling the recovered metal. Below is a "generic" planning chart for budget planning. The chart is based on a typical Spring 2008 cost of **\$1 for 1 lb of batteries on air cargo within Alaska**, using the national average of **2 lbs of batteries per household each year**. Most shipping companies will require a minimum charge, about \$50, so save your batteries until you meet the minimum charge. **For within Alaska flights, speak with your cargo company to ask whether they can provide free or reduced rate shipping, as a community service donation.** Also, remember if you work with Total Reclaim to ship your batteries, they can help you with the Rasmuson/Greenstar program shipping rebate. You can use this to pay your shipping company some costs, or use it help cover other costs of your program. You will need to speak with your end recycler and the shipping company to see if they are able to deliver your batteries straight to the door.



Recycle Cost Planning Table for Household Battery Recycling
Assuming shipping within Alaska on cargo plane
(Annual Estimates)

Recovery Rate	200-person village	400-person village	600-person village	800-person village
10%	\$10	\$20	\$30	\$40
20%	\$20	\$40	\$60	\$80
30%	\$30	\$60	\$90	\$120
40%	\$40	\$80	\$120	\$160
50%	\$50	\$100	\$150	\$200
60%	\$60	\$120	\$180	\$240
70%	\$70	\$140	\$210	\$280
80%	\$80	\$160	\$240	\$320
90%	\$90	\$180	\$270	\$360
100%	\$100	\$200	\$300	\$400

A good starting goal for household battery recovery would be 10% of all the household batteries in community. Each year, you will be able to get more people to participate. So for your IGAP budget, you could request money for recycling about 10% to 20% the first year. Then the next year, you could budget funding to recycle more of the batteries. You can step up the recovery rate each year with education.

Mercury Solutions (for button cells) This company will take the mercuric oxide button batteries that Total Reclaim cannot accept. These batteries are the highest mercury content and are extremely important to keep out of landfill and burnbox.

21211 Durand Avenue Union Grove, WI 53182

Phone: (518) 459-0820

Days/Hours: Monday to Friday 8am to 4pm

Notes: Through the MEREKO Button Battery Program, you can receive payment for used watch or hearing batteries while solving a difficult disposal problem.

Complete Recycling Solutions, LLC

One Father Devalles Blvd

Fall River, MA 02723

Phone: 866-CRS-9797

Fax: 508-402-7750

Email: kboyea@crsrecycle.com

EPSI (Earth Protection Services, Inc.)

10 South 48th Avenue, Suite #4

Phoenix, AZ 85063

Phone: (800) 414-0443

Web link: www.earthpro.com/

KBK Innovations

Weblink: www.kbk-innovations.net/

Email: benkbk@juno.com

Fax: (480) 857-0794

NES (National Environmental Services)

Tucson, AZ 85705

Phone: (800) 872-2226

Web Link: www.nesllc.com

Program Participation

[Click on the otter](#) to find out how to conduct a battery wastestream study and program participation rate, or look up "Batteries", then "Counting Your Battery Wastestream" in the SWAN A-Z Index.







Additional Resources





The Earth 911 battery resource site lists several places for additional information concerning household batteries as well as other hazardous wastes:

http://alaska.earth911.org/master.asp?s=lib&a=electronics/bat_links.asp

NON-RECHARGEABLE BATTERIES

Battery Type	Description	Mercury, Cadmium, or Lead content?	Major Components	Uses
Carbon –Zinc or Zinc Carbon	The cheapest battery. Have much shorter life span than alkaline batteries. Cylindrical or rectangular cells; labeled as “General Purpose”, “Heavy Duty”, or “Classic”	No, relatively safe for land disposal.	Zinc, carbon, ammonium chloride	Flashlights, toys, remote controls clocks, garage door openers, pagers, and smoke detectors.
Alkaline Manganese (non-button cell)	 The most popular, better performance, higher cost. Cylindrical or rectangular cells; the most commonly recognized battery. Labeled “alkaline”	Not after 1996, relatively safe for land disposal.	Zinc, manganese Dioxide, Potassium hydroxide	Flashlights, radios, toys, calculators, remote controls, electronic games, portable radios and televisions, garage door openers.
Alkaline Manganese button cells	 Common button cell uses. Button-shaped. May or may not be marked.	Yes. About 25 mg of mercury, equal to 0.5 % by weight	Zinc, manganese Dioxide, Potassium hydroxide	Watches, calculators, toys, some cameras.
Lithium	 Expensive, long shelf-life. Varied shape, often small. 9-volt, C, AA, coin, button	No, but Lithium is highly reactive, and used as a medicine for serious mental health problems. These should be recycled.	Lithium, Manganese Dioxide or Polycarbon monofluoride, solvent	Cameras, pagers, keyless locks
Zinc air	Made to replace the mercuric oxide batteries in hearing aids. Usually button shaped. Identify by pinhole on one side.	Yes. About 1% mercury.	Zinc, carbon	Hearing aids, pagers
Mercuric Oxide (or “mercury-zinc”) button batteries	No longer made or sold due to their high mercury content. But you might find some of these for several more years.	Yes, a lot - 35 to 50% mercury -- In consumer applications, zinc air button cells have replaced mercuric oxide batteries, which cannot be sold in the U.S. any longer.	Mercuric oxide, Zinc, Potassium Hydroxide	Hearing aids, watches, and other items requiring a small battery.
Mercuric oxide (“mercury –zinc”) larger batteries	Rarely found in households now. Often looks like 9-volt or fat AA batteries, should be labeled.	These are the worst because they are big and have a high mercury content . Luckily, you will find these only (maybe) at the clinic, but check pre-1996 batteries or foreign batteries.	Mercuric oxide, Zinc, Potassium Hydroxide	They are now used in the U.S. only for specialized industrial, medical, emergency equipment.
Silver Oxide	 Made to replace mercuric oxide buttons for many applications. Button shaped with no distinguishing marks.	Yes. About 1% mercury. Often smaller than Alkaline Manganese button cells.	Silver oxide, zinc, potassium hydroxide	Watches, calculators, toys, greeting cards, musical books.

RECHARGEABLE BATTERIES (all rechargeable batteries can be recycled cheaply or for free – go to www.rbrc.org or call 1-800-9-BATTERY)

Battery Type	Description	Mercury, Cadmium, or Lead content?	Major Components	Uses
<p>Nickel-Cadmium (NiCad)</p> 	<p>Popular recharge battery and least expensive of rechargeables. Look for recycle logo or words “battery must be recycled or disposed”</p>	<p>Yes, Cadmium.</p>	<p>Nickel, Cadmium, Potassium Hydroxide</p>	<p>Power tools, cordless phones, professional radios</p>
<p>Nickel Metal Hydride</p>  <p>(Power tool battery example)</p>	<p>Cadmium-free replacement for Ni-Cad, more expensive but considered to be less toxic. Look like NiCad batteries.</p>	<p>No, just Nickel, with some other metals. These are much less toxic. Relatively safe for land disposal, but easy to find a recycler.</p>	<p>Nickel, some “Rare Earth” metals, Potassium Hydroxide.</p>	<p>Same.</p>
<p>Lithium Ion</p> 	<p>As compared to non-rechargeable Lithium batteries, a good choice. Expensive. Varied-shapes, depends on use.</p>	<p>No. Lithium – again this is not something you want in your environment.</p>	<p>Lithium, solvent, and cobalt oxide</p>	<p>Computers, cellular phones, digital cameras</p>
<p>Rechargeable Alkaline</p>	<p>Moderate performance compared with Ni-Cad, but costs less and relatively non-toxic. Looks like regular alkaline batteries</p>	<p>No. Relatively safe, but easy to recycle anyway.</p>	<p>Zinc, Manganese Dioxide, Potassium Hydroxide</p>	<p>Same uses as normal alkaline and carbon-zinc batteries.</p>
<p>Small sealed lead-acid</p> 	<p>There are still toys and other devices that use lead-acid batteries, especially those from foreign countries. Look like 6-volt or other odd-shaped smaller batteries. Look for recycle logo or words “battery must be recycled or disposed”</p>	<p>Yes. High lead content. You might be able to backhaul these with your vehicle lead-acid batteries – ask your recycler.</p>	<p>Lead, sulfuric acid</p>	<p>Alarm systems, emergency lighting. Some toys and other miscellaneous devices.</p>

Sources: RBRC Battery Lesson Plan, www.rbrc.org, Guide for Identifying Mercury in Household Applications, www.burlington.org/health/Mercury.htm, various retail websites.

Note: Pictures are examples only. A number of companies manufacture and distribute each type of battery.