Potential Solutions White Paper

Southeast Alaska Regional Municipal Solid Waste Management Strategy

DRAFT

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1. INTRODUCTION

This white paper presents and analyzes feasible solutions for equipment, processes, and other infrastructure for communities in Southeast (SE) Alaska. It combines detailed and thematic findings from extensive community outreach to thirty-five communities and numerous regional partners with research on emerging technologies and practices for Municipal Solid Waste (MSW) management.

1.1 Equipment, Processes, and Other Infrastructure

In RESPEC's detailed community and regional analyses, we've identified how waste management and disposal vary according to each community's existing solid waste infrastructure, waste streams and waste composition, and diversion programs. Some of these communities, especially those that are smaller and more isolated, are seeking to address core needs, including acquiring processing equipment (e.g., balers, shredders, storage units), signage, and funding to start disposal and/or diversion programs. Others are considering how to improve their waste management practices to become more efficient, less costly, and environmentally friendly. A few are satisfied with their current practices and are not actively changing their systems. Improved awareness and education is also a necessary component of an effective solid waste management system.

To consider all communities' specific conditions and needs, this white paper organizes potential solutions into three sections:

- **Meet "Basic" Needs:** Ensure the community has a functional solid waste management system that protects human and environmental health and can be maintained with a budget feasible for the community.
- **Level Up Systems**: Support efforts to increase efficiency, implement new technology, and develop innovative systems and programs.
- **Connect and Collaborate**: Leverage Southeast Alaska Solid Waste Authority's (SEASWA's) role to facilitate connections between waste management systems and create joint programs that benefit multiple communities.

These sections are meant to make this white paper more accessible and useful for readers, but there is overlap between each category and real-world solutions will not occur in isolation.

2. Meet "Basic" Needs

Many communities in SE Alaska do not have sufficient equipment to manage their MSW efficiently. Table 1 summarizes the infrastructure, equipment, programming needs, and planned projects that were identified through Tribal and municipal engagement, discussions with the Alaska Department of Environmental Conservation (DEC), and input from other regional entities. Meeting these needs will help lay the groundwork for ensuring all communities have a functional solid waste management system that protects human and environmental health. This can be accomplished either by each community working independently (e.g., purchasing equipment with municipal or Tribal budgets or grant funds) or through regional cooperation (see Chapter 4 *Connect and Collaborate)*.

Note about Table 1: Several communities did not respond to outreach, though RESPEC was able to obtain some information about these communities through other regional partners.

- *"Unknown" means outreach was unsuccessful and other partners were not able to provide detail.*
- *"None identified" means community representatives responded to outreach but did not explicitly state whether they had upcoming projects or purchases.*
- *"None at this time" means community representatives explicitly confirmed there were no upcoming projects or purchases.*

***Table 1.** Needs by Community*

	Landfill Infrastructure	Equipment	**Other** (funding, programming, planning)	Notes & Recommendations	Planned Projects & Purchases
Angoon	○ Signage ○ Security cameras ○ Storage (recyclables, hazardous waste) ○ Land for expansion ○ Space for waste processing (vehicles, white goods)	○ Tire shredder		○ Rent SEASWA tire shredder	○ Glass crusher ○ Conexes ○ Skid steer
Coffman Cove	○ On-island recycling plant		○ Island-wide annual scrap metal clean-up and removal	○ Feasibility study for recycling plant ○ Develop a scrap metal removal program that includes funding, potential partners, and handling protocols	○ Unknown
Craig	None identified				
Edna Bay	Unknown				
Elfin Cove			○ A system to manage waste disposal	○ Feasibility study for smaller incinerator system	○ None identified
Gustavus	○ Larger building	○ Horizontal baler		○ Site analysis for larger building ○ Purchase baler	○ Developing a new recycling facility
Haines	○ Facility to store junk cars	○ Sifter for processed	○ Funding for junk car removal	○ Site analysis for facilities	○ HFR is in the process of purchasing a property with a

	Landfill Infrastructure	Equipment	**Other** (funding, programming, planning)	Notes & Recommendations	Planned Projects & Purchases
	○ Collection facility in Mosquito Lake	compost (Chilkat Valley Compost Center)	○ Funding for new facility (HFR)	○ Coordinate with SEASWA to explore funding options	building on it, with the goal of moving operations in late spring 2026
Hobart Bay	Unknown				
Hollis	Unknown				
Hoonah	○ Garbage truck (including storage)	○ Tire shredder ○ Baler and Quonset hut for cardboard (Icy Strait Point)	○ Additional staff	○ Rent SEASWA tire shredder ○ Purchase garbage truck, baler, and quonset	○ Icy Strait Point has purchased an aluminum baler, which will arrive in 2025
Hydaburg	○ Signage ○ Storage for recyclables ○ Garbage truck (including storage)		○ Additional staff	○ Purchase garbage truck and signage	○ Hydaburg and the Alaska Native Tribal Health Consortium (ANTHC) plan to improve the Hydaburg Landfill with a fence, signs, and new incinerator
Hyder			○ Means to fund solid waste management	○ Establish a solid waste utility	○ None identified
Juneau	○ Transfer station	○ Large industrial grinder	○ Replacement plan for when Capitol Disposal Landfill closes	○ Consider opportunities for recycling and HHW facilities in replacement plan	○ CBJ Engineering and Public Works is in the planning process of developing a Zero Waste Campus and received guidance from the Assembly to include a transfer station on that campus
Kake	○ Fencing ○ Signage ○ Garbage truck (including storage)	○ New burn unit	○ Land ownership or agreement	○ Purchase fencing, signage, and garbage truck ○ Feasibility study for new burn unit	○ Unknown

	Landfill Infrastructure	Equipment	**Other** (funding, programming, planning)	Notes & Recommendations	Planned Projects & Purchases
Kasaan	○ Storage for recyclables ○ Garbage truck (including storage)			○ Purchase garbage truck ○ Site analysis for storage	○ The Organized Village of Kasaan plans to purchase a glass crusher and is working with the City of Klawock to set up an abandoned / derelict vehicle staging area
Ketchikan		○ New equipment		○ Equipment is well-maintained but aging and will eventually need replacement	○ Unknown
Klawock	○ Fencing ○ Signage ○ Garbage truck (including storage)	○ Front end loader ○ E-waste recycling containers ○ Small excavator	○ Recycling and compost programs ○ Vehicle and white goods backhaul ○ New water monitoring program for landfill	○ Produce cost estimates for needed infrastructure and equipment	○ The HHW building will be upgraded to hold electronics and create an area for reuse. The Organized Village of Kasaan plans to develop a large composting program at the Klawock Landfill.
Klukwan	○ Signage ○ Storage for recyclables	○ Burn unit		○ Purchase signage and storage ○ Feasibility study for burn unit	○ Unknown
Kupreanof	Unknown				
Metlakatla		○ Baler ○ Scale		○ Purchase baler and scale	○ MIC has a large industrial shredder on-island, but it needs to be set up and staff need to be trained
Naukati Bay	Unknown				
Pelican		○ Shredder for large demolition waste		○ Feasibility study for large scale shredder	○ The City is in conversation with ADEC about expanding the landfill, which would require permitting

	Landfill Infrastructure	Equipment	**Other** (funding, programming, planning)	Notes & Recommendations	Planned Projects & Purchases
					and possibly requesting land from the State of Alaska
Petersburg			○ Funding for compost program (PIA)	○ Explore funding options with SEASWA	○ The recycling facility may be expanded in the future, which may include a recycling drop-off area by the landfill. The Borough is also interested in re-opening the landfill to construction & demolition waste, but does not have a formal plan in place
Point Baker	Unknown				
Port Alexander	Unknown				
Port Protection	Unknown				
Saxman	○ Unknown	○ None identified			
Sitka	○ Bear cans		○ More diversion methods ○ Public communication ○ Long-term plan for waste management	○ Purchase bear cans	○ None planned
Skagway		○ New incinerator		○ Feasibility study for incinerator	○ A new incinerator is anticipated to come online by the end of 2027
Tenakee Springs			○ Revised waste management system	○ Establish a solid waste utility (including a transfer station)	○ None identified
Thorne Bay		○ Enclosed burn unit		○ Feasibility study for burn unit	○ A new cell is planned at the landfill

	Landfill Infrastructure	Equipment	**Other** (funding, programming, planning)	Notes & Recommendations	Planned Projects & Purchases
		○ Certified refrigerant recovery equipment		○ Purchase refrigerant recovery equipment	
Whale Pass	Unknown				
Wrangell		○ Tire shredder ○ Glass crusher		○ Rent SEASWA tire shredder ○ Purchase glass crusher	○ Transfer station is switching to a baling operation. Recently received grants for a new garbage truck and a loading dock project
Yakutat	○ None identified	○ Yakutat applied for a $2 million grant with Bristol Environmental to expand and modernize landfill operations, including purchasing new machinery, based on a plan funded by a USDA Rural Development grant			

2.1 Waste Diversion Programs

Communities across SE Alaska face limited landfill availability and high costs in shipping waste due to their geographic isolation. There is the opportunity to develop diversion programs to reduce the amount of waste ending up in shipping containers, extend the life of landfills, and lower costs of shipping waste.

2.1.1 Regional Collaboration for Recycling

Many communities already have strong adoption rates of waste diversion strategies, including through for-profit, nonprofit, and Tribal entities, including the Prince of Wales (POW) Tribal Environmental Coalition (TEC), the Chilkat Valley Compost Center, Haines Friends of Recycling (HFR), and Gustavus Disposal and Recycling Center (DRC). Certain communities (e.g. Petersburg and Haines) are exploring the possibility of building or expanding recycling facilities. Some of these places may be willing to accept one or more specific types of recyclables from other communities in the region. RESPEC recommends that SEASWA act as a facilitator between communities and emerging Material Recovery Facilities (MRFs). It is expected that local or regional MRFs will lower shipping costs and generate more revenue by exporting materials that are ready for reentry to the supply chain (i.e. higher quality and more compact than unprocessed recyclables).

Diversion programs require planning and community buy-in. Public works directors and other stakeholders and decision makers, such as elected officials, need to select the most feasible method for collecting materials (e.g. curbside collection, drop-off, or a combination of both), the necessary infrastructure (e.g. storage units, collection bins), and strategies for communicating with the public and encouraging participation. Local waste generators (e.g. community members, businesses, etc.) are typically responsible for pre-sorting their waste, which reduces the burden on public works staff.

SE Alaska communities can customize recycling on a local scale to fit their specific waste streams. Even if the program only focuses on one material, it is beneficial to reduce the volume of MSW landfilled locally or weight shipped externally. Communities could collect revenue by imposing a fee-based system or tax, or they could apply for funding (e.g. EPA's Solid Waste Infrastructure for Recycling Grant Program (SWIFR); Indian Environmental General Assistance Program (IGAP)).

2.1.2 Community and Decentralized Composting

Community and decentralized composting is a relatively low-cost option for diverting food waste from landfills. Communities could establish compost drop-off sites at community gardens, and residents could grow food on individual plots with the compost. These sites would require fencing or storage containers to ward off animals from the compost piles. Compost could be used residentially, for a community garden, or packaged and sold (e.g. Juneau Composts, Petersburg Indian Association).

2.1.3 Salvage and Reuse

Communities can also designate large, unused parcels as salvage/reuse areas. These are simple, covered areas where residents can drop off items that aren't suitable for thrifts stores but could be reused or repurposed; some landfills already have designated salvage areas. These spaces can be minimally managed or could have on-site staff (or volunteers) who intake items such as fabrics, electronics, household appliances, building materials, vintage goods, and scrap metal. These solutions are less costly than recycling or composting facilities. In 2017, the City of Ketchikan's landfill (Class III) reported to offer a permit program that allowed people to go to the landfill and take salvage for any items they wanted, which helped reduce landfill volume.[1]

2.1.4 Repair Centers

Repair centers could be established on the same parcels as salvage/reuse areas or on smaller sites. These centers prolong the life of items in disrepair, like old electronics, enabling products to stay in use longer, minimize waste, and encourage sustainable consumption. Communities can also encourage the use of thrift stores, salvage areas, and reuse sheds by adjusting zoning code and advocating for "Right to Repair" legislation.

2.1.5 Awareness and Education

In some communities, there is a lack of awareness and education for solid waste issues and practices. Communities reported illegal dumping and incorrectly sorted items. Improperly sorted materials can contaminate recyclable or compostable materials or, in the case of hazardous waste, cause serious harm to workers, the environment, and infrastructure. For example, when electronic waste (lithium-ion batteries) is combined with MSW, it can cause fires and release harmful chemicals. Targeted education will be an important factor in whether diversion programming is successful. SEASWA could collaborate with communities to create local guides on recycling options (e.g. stores

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[1] https://www.krbd.org/2017/10/17/talking-trash-ketchikans-salvage-permit-program/

that accept vehicle batteries, where to dispose of netting, etc.). School and library programs could be established to teach kids why and how to divert waste. Communicating locally relevant benefits of recycling and composting through signage, flyers, or pamphlets can incentivize communities to participate in these programs.

3. Level Up Systems

"Leveling up" refers to increasing efficiency, implementing new technology, and developing innovative systems and programs in communities with existing MSW systems. Emerging and improving technologies are changing the ways in which MSW is treated and disposed. A report being developed for SEASWA, titled *Innovative and Future Technologies*, outlines recent high-level technological advancements in MSW management to lay the foundation for assessing options that would be feasible and best meet community and regional needs across SE Alaska. From the document, a list of feasible solutions was compiled, which are described in detail in the following subsections.

3.1 Waste Compaction

Compaction is a type of solid waste reduction treatment that reduces the volume of bulk waste, which can reduce operational and labor costs, improve safety at the landfill, and extend the lifespan of a landfill. Compaction primarily occurs at landfills but can also occur within specialized garbage trucks during waste collection. They can be static or portable and are designed to work with a range of waste streams. Waste can be mechanically converted into fuel sources by compacting certain waste materials (e.g. biomass, cardboard, paper) into high-density briquettes[2] or logs which can be used for fuel and heat. This technology can provide renewable and lower cost sources of energy.

3.2 Crushed Glass Recycling

Glass waste is heavy and bulky, taking up a significant amount of space in landfills. It is also one of few materials that can be recycled indefinitely without loss in purity and quality. A glass crusher can process more than 4,000 bottles per hour, reducing glass volume by up to 80%.[3] After initial crushing, the crushed glass, called cullet, is sorted and cleaned. In some cases, it is prepared to be mixed with other materials to be melted down and reused. Mixed or contaminated cullet is utilized as construction

[2] Briquette Manufacturing: https://weima.com/us/briquetting-machines/ - https://www.ruf-briquetter.com/
[3] Importance of Glass Crushers in Waste Management: https://gradeall.com/the-importance-of-glass-crushers-in-recycling/

aggregate or filtration media, the typical use within Alaska. Outside of Alaska, crushed glass has been used in coastal restoration projects[4] [5] and in the production of fiberglass insulation.

A Bottle Crusher has a compact footprint and can operate in tight spaces, whereas a Large Glass Crusher and Conveyor system requires ample space for both the conveyor feed section and the crusher unit. These machines are made to handle a high volume of glass and continuous processing. To be an effective form of recycling, glass does need to be sorted separately from other waste streams, so dedicated containers for glass could be beneficial depending on the anticipated volume.

In 2012, the Alaska Department of Transportation and Public Facilities (DOT&PF) approved the use of recycled glass in construction projects to spur local manufacturing of green products, create jobs, and reduce landfill waste. In addition to reducing the amount of glass in landfills, the recycled glass is used in the base of construction projects and reduces DOT&PF's need for rock and gravel that are typically used to strengthen highway and airport subsurface.[6] Anchorage and the Mat-Su Valley both offer glass recycling in Alaska. Currently in SE Alaska, Gustavus, Pelican, and Tenakee Springs have glass crushing equipment, while Angoon and Kasaan have identified a glass crusher as a planned future project.

3.3 Alternative Fuels

Electric vehicles (EVs) and vehicles fueled by biodiesel are promising for SE Alaska due to pre-existing infrastructure, lower long-term operating costs, and available fuel supplies (for biodiesel). Both fuels face high capital costs and long-term maintenance, which would require access to technicians.

3.3.1 Electric Vehicles

EVs draw electricity directly from on- and off-grid sources and store the energy in batteries. Electricity can be produced from a variety of energy sources, including natural gas, coal, nuclear energy, wind energy, hydropower, and solar energy. They produce no emissions, use less energy, have lower long-term operating costs, and have a longer life expectancy than diesel engines. There are high upfront costs of EVs and associated charging infrastructure, and they have a limited range due to the need to

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[4] Coastal and Marshland Restoration Using Crushed Glass: https://andelaproducts.com/coastal-marshland-restoration/

[5] Wetland plant growth in recycled glass sand versus dredged river sand: https://www.researchgate.net/publication/389790433_Wetland_plant_growth_in_recycled_glass_sand_versus_dredged_river_sand_evaluating_a_new_resource_for_coastal_restoration

[6] DOT&PF Approves the use of Recycled Glass in Construction Projects: https://dot.alaska.gov/comm/pressbox/arch_2012/PR12-2607.shtml

recharge, which takes at least a few hours to reach sufficient battery capacity. In areas where there is pre-existing EV infrastructure and limited road miles, like Juneau, this is less of an issue and use could be more feasibly expanded.

It should be noted that EV lithium batteries will also create new waste streams as these boats and automobiles reach their end of life. Most EV batteries last about 8-10 years, depending on use. Communities should be preparing now to responsibly recycle these batteries to avoid environmental risks from chemical contamination and to recover valuable metals like lithium, nickel and cobalt that can then be reused. The Environmental Protection Agency (EPA) provides general guidance on lithium-ion battery recycling[7] and is planning to propose new rules to improve management and recycling standards for lithium batteries. In October 2025, the EPA's Lithium-Ion Battery Taskforce released the 2025 Lithium-Ion Battery Response Guide[8] that provides guidance on handling, emergency response, and recycling/disposal among others.

As of early 2026, Alaska Marine Lines has initiated an indefinite moratorium on shipping EVs to and from Alaska, due to the fire risk posed by lithium-ion batteries.[9] Currently, EVs can be shipped on the road system or two-at-a-time on the ferry, significantly impacting accessibility for SE Alaska.

3.3.2 Biodiesel

Biodiesel is a domestically produced renewable fuel that can be manufactured from vegetable oils, animal fats (including those derived from fish waste), or recycled restaurant grease. This could be an opportunity to create a sustainable circular economic model by converting fish waste from the aquacultural industry into fuel for solid waste systems. One of the biggest benefits of biodiesel is that it does not require new vehicles or any significant investment in infrastructure. It can be used as a direct replacement for diesel in existing vehicles without any changes in its physical properties. Biodiesel can be blended with petroleum diesel to improve fuel lubricity and increase its combustion efficiency, with some blends more suitable for cold weather climates than others. Having a reliable source of biodiesel would require access to a biofuel production plant, and none currently exist in SE Alaska.

[7] EPA Lithium Battery Recycling: https://www.epa.gov/hw/lithium-ion-battery-recycling
[8] EPA Lithium-Ion Battery Response Guide: https://response.epa.gov/sites/16141/files/EPA%20OSC%20Lithium-Ion%20Battery%20Response%20Guide.pdf
[9] AML Transport of EVs to SE Alaska: https://www.ktoo.org/2026/02/12/alaska-marine-lines-ferry-system-staff-discuss-options-for-safely-transporting-electric-vehicles-to-southeast-alaska/

3.4 Smart Bins

Artificial intelligence (AI) enables systems to make informed decisions based on large amounts of data, while Internet of Things (IoT) refers to a network of sensors, software, devices, and other physical objects that are linked through wireless and wired networks and provide real-time monitoring. Together, IoT- and AI-based solutions allow waste bins to be monitored in real-time which would generate data used to inform decision-making for waste collection planning and operations.

Networks sensors embedded in waste bins could identify the type of waste in the bins, monitor waste bin fill levels and transmit the data to cloud platforms to signal collection teams once they are full. IoT-enabled platforms then analyze the data and formulate the most appropriate response to transmit to collection teams. Solid waste collection teams would collect the bins based on the most optimal routes calculated by AI-driven algorithms, leading to reductions in unnecessary trips, fuel consumption, and operational costs.

While initial small-scale pilot deployments have proven successful, city-wide implementations of smart waste IoT are limited, as this is an emerging technology that currently lacks robust evaluations. There are high initial investments required to deploy AI and IoT systems, as well as data security issues and potential compatibility issues with traditional solid waste infrastructure. Furthermore, AI and IoT would require reliable access to electricity and the internet, which may prove difficult in more isolated communities.

One of the main challenges affecting solid waste collection in SE Alaska is wildlife accessing waste bins. Placing bear-resistant smart bins in strategic locations, such as high density or high-traffic areas, could improve this issue. This would require exploring the feasibility of using smart waste technology as a wildlife management strategy.

3.5 Materials Recovery Facilities

A MRF is a facility employing various automated and/or manual processes to sort recyclable materials and prepare them for sale to various markets. They vary significantly in size, ranging from less than 10 tons/day over to several thousand tons/day.

MRFs across the United States are updating their equipment to partially or fully include automated technology such as AI-powered optical sorting systems and AI-powered robotics. AI models are trained on diverse image datasets capturing visual patterns and features across various material types. Cameras and computer vision capture the live images and analyze the data, which is sent to waste operators to optimize their process and increase their recovery. Robotic arms are also equipped with AI-enabled vision systems and suction or gripper mechanisms, allowing them to pick, sort, and separate waste items with high accuracy based on visual information. By combining data from multiple sensors (NIOS, XRF, etc.), AI-powered sorting systems synthesize this data to analyze the physical and chemical properties of waste items and sort with greater efficiency. These tools perform more quickly and accurately than human sorters, and they eliminate the health risk posed by manual waste sorting to humans (due to disease-causing agents present in garbage) while conserving energy and production costs.

SE Alaska MSW managers are challenged by limited available trained staff to sort materials, and automated facilities could mitigate this issue. Implementing automated features, however, would require access to specialty technicians, which is limited in the region. Additionally, automated facilities are expensive, have uncertain life spans, and have maintenance needs which may be difficult to undertake in more rural and remote communities. There also can be limitations in their identification and processing of materials.

3.6 Anaerobic Digestion

Anaerobic Digestion (AD) is a naturally occurring sequence of processes in which microorganisms break down organic materials in the absence of oxygen. AD accepts feedstocks such as manure and agricultural waste, wastewater biosolids, food waste, fats, oils, and greases. Prior to being placed in the AD, the feedstocks undergo pre-processing such as screening, size reduction, contamination removal, and storage. They can be digested singularly or in combination, which is a practice called co-digestion. The breakdown of organic matter generates biogas, which mostly comprises methane and CO_2, and digestate, a semi-solid material rich in nitrogen and phosphorus which can be used as a feedstock for organic fertilizer, animal bedding, crop irrigation, or as an alternative daily cover for landfills. AD has been used in wastewater treatment plants and on farms as a means of controlling excess volumes of manure beyond what is in demand.

AD can be designed to process one type of feedstock or multiple feedstocks. Wet ADs and dry ADs are classified according to the moisture content of the feedstocks. Wet ADs accept feedstocks that contain less than 15% solids and are in slurry form, such as sludge and biosolids. Dry ADs generally process feedstock with greater than 15% solids, so it is most suitable for food waste and woody materials. ADs are also designed based on feedstock flow. Feedstocks that are loaded into the digester all at once are called batch digesters. In continuous flow digesters, feedstock is constantly fed into the digester, and digested material is continuously removed.

As of 2024, there are 313 AD facilities in operation across the U.S, with five located in the Pacific Northwest. There are over 1,200 municipal and industrial wastewater treatment facilities in the U.S. that have ADs treat wastewater solids and produce biogas. Most ADs are large-scale facilities, and establishing a 2,500 ton/year AD facility could cost, at minimum, around $3.0 million USD in capital costs and $85,000 USD in operation and maintenance costs. Anaerobic digestion has not been implemented in Alaska but could be a viable option for processing septic sludge at a small scale. There are smaller scale ADs that are commercially available, but overall supply is limited. The *Innovative and Future Technologies Report* identified at least two manufacturers based in the United Kingdom and in Australia (respectively *SEaB Power* and *Finn Biogas*).

3.7 Mass Burn Incineration

Mass-burn incineration, or direct combustion, is the burning of waste in the presence of oxygen to reduce its overall volume at landfills while producing heat and power. It is a type of Waste-to-Energy (WtE) technology, which is recognized as biological, thermal, and thermochemical methods that harness energy from *residual waste* (i.e. waste that cannot be diverted by recycling, composting, or other means) and to reduce overall volume in landfills. The energy produced from WtE facilities is used to generate electricity or supply heating to buildings. The *Innovations and Future Technologies Report* reviewed recent research and reports on five WtE technologies: mechanical biological treatment, landfill biogas recovery, mass burn incineration, gasification, pyrolysis, and hydrothermal processing.

It is typically used for residual MSW that cannot be recycled or reused and is the preferred option for contaminated MSW, such as medical waste. Mass burn systems operate most efficiently with drier waste, but they can be designed to accept waste with a higher moisture content. The feedstock for mass-burn incineration generally requires little upfront pre-treatment compared to pyrolysis and gasification. There are at least 75 mass burn facilities currently operating across the country, none located in Alaska. In 2019, the EPA released a memo regarding incinerations potential ability to manage per- and polyfluoroalkyl substances (PFAS)[10], but gaps in research still exist.

There are three types of mass burn incineration facilities:

[10] https://www.epa.gov/sites/default/files/2019-09/documents/technical_brief_pfas_incineration_ioaa_approved_final_july_2019.pdf

- **Mass Burn Facilities**: Mass burn facilities, also known as moving/stepped grate system, are the most common type of combustion facility in the U.S. They are designed to accept large quantities of residual MSW with little pre-treatment and burn the waste in a single-stage chamber. They can burn sorted or unsorted waste. Once the waste is moved to a furnace, waste feedstock is transported across the combustion chamber using mechanically actuated grates or rollers. As the feedstock is transported along the grates, moving air agitates and mixes with the air for efficient burning. The average size of facilities in the U.S. is over 400,000 metric tons per year. A new plant typically requires at least 100 million dollars to finance the construction.
- **Modular Systems**: Modular systems are usually prefabricated units with capacities between 5 and 200 tons of MSW per day. These are much smaller and more portable facilities than Mass Burn Facilities and burn unprocessed, mixed MSW. These systems can be designed as containerized units for fixed locations or as trailer-mounted units or skid-mounted units which can be moved from site to site. They can be scaled down to portable drum incinerators, making them ideal for remote, low-density communities. Due to their smaller sizes, they have lower capital and operational costs associated with traditional incinerators. However, they do not benefit from the economies of scale available to larger facilities. They produce heat and ash residue as byproducts.
- **Refuse Derived Fuel Systems (RDF)**: RDF systems use mechanical methods to shred MSW. The systems first separate combustible materials (e.g. papers, plastics, organic materials) from non-combustible materials (e.g. metals, glass). This is done using sorting, size reduction (i.e. shredding), magnetic separation, and air classification. The result is RDF, which is a combustible mixture that is suitable as fuel in a dedicated furnace or as supplemental fuel in a conventional boiler system. The RDF produces heat and ash residue as byproducts. This technology is not as widespread as mass burn facilities due to its operational demands and high level of maintenance required.

Incineration is a well-established technology, but it is currently experiencing slow growth compared to landfilling in new construction due to high capital and operating costs. Incineration is known to pose significant health and environmental risks. It produces ash that is considered hazardous and requires treatment to mitigate potential leaching before it's transported and disposed of at a landfill designed to protect against soil and groundwater contamination. Incineration also releases toxic pollutants, including dioxins, heavy metals, and particulate matter into the atmosphere. Facilities are held to stringent environmental and air pollution control standards and must install air pollution control technology that removes pollutants from the combustion gas before it is released.

4. Connect and Collaborate

This section recommends methods of leveraging SEASWA's role to facilitate connections between waste management systems and create joint programs that benefit multiple communities. There is expressed community interest in sharing equipment and resources through regional collaboration, as well as opportunities for more municipal-Tribal partnerships and cross-community collaboration. Greater collaboration could lead to more funding opportunities, make costly solutions affordable, and support communities without the organizational capacity to implement a management plan and deliver services. Implementation of associated plans, programs, and infrastructure projects would require approval from elected officials and buy-in from the community, making robust engagement efforts necessary to ensure continued support.

The Prince of Wales Tribal Environmental Consortium is an example of successful regional collaboration that increases capacity (e.g. staff, resources, etc.) to address solid waste challenges with an environmental focus. This organization, which comprises Craig Tribal Association, Hydaburg Cooperative Association, Klawock Cooperative Association, and the Organized Village of Kasaan, engages a range of environmentally focused programs and activities including electronic waste recycling, trash clean-up events, and compost and recycling programs.

4.1 Decentralized Hubs with Centralized Support

Several communities are already working to expand solid waste management to meet the needs of other communities, such as Thorne Bay, which accepts waste from other Prince of Wales communities at its landfill, and the Village of Kasaan, which plans to develop a large composting program at the Klawock Landfill. In addition, the City and Borough of Juneau (CBJ) is considering a zero-waste campus with a transfer station which will be under greater CBJ control than the current Capitol Disposal Landfill and may be able to engage in regional collaboration. These projects create opportunities for communities to co-develop large projects and shape regional hubs, which would centralize collection, sorting, processing, and disposing waste.

4.2 Regional Administration and Support

SEASWA was created under Alaska law[11] to help communities in SE Alaska work together to manage garbage and recycling. Its mission is to protect public health and the environment, save energy, and reduce pollution. SEASWA can act as a central entity that provides support or facilitates mass equipment purchases, collaborates with communities on solid waste projects, applies for state and federal funding on behalf of communities, and aggregates information and resources. This would require SEASWA to be a consistent, reliable entity that can support communities as they experience staff turnover and may require hiring SEASWA staff. Table 2 illustrates Potential Responsibilities and Key Steps if SEASWA were to provide support efforts on a broader scale.

Table 2. *SEASWA Potential Responsibilities and Outcomes*

Potential Responsibilities	Key Steps & Requirements
Support waste diversion program development	○ Create a centralized list of disposal options for certain materials (e.g., stores that accept vehicle batteries, where to dispose of netting, etc.)
Job training and professional development	○ Developing training and onboarding MSW management materials for SEASWA-member communities ○ Develop and monitor an online job posting page for communities that need landfill operators
Assume an advocacy/lobbying role	○ Develop a solid waste advocacy network within SEASWA communities and strengthen relationships with state representatives
Funding acquisition and administration	○ Provide support for grant writing and reporting
Expand MSW infrastructure	○ Tracking, collecting, and analyzing data of factors including waste streams, waste composition, diversion rates, major infrastructure. ○ Act as a contract holder for 'collective' contracts ○ Develop protocols for purchasing and leasing equipment as a regional body

[11] Alaska Statute 29.35.800–29.35.925: https://law.justia.com/codes/alaska/title-29/chapter-35/article-10/

4.3 Equipment Sharing Network

Several communities expressed the need for equipment and infrastructure to sort, process, and store waste. Frequently mentioned needs included vehicles for transporting waste, shredders, balers, incinerators and burn units, signage, and storage for recyclables and special types of waste (e.g. junk cars, hazardous waste, e-waste). Some communities are interested in developing solid waste management strategies or revisiting existing ones.

Some communities may not be able to purchase and own new equipment, but they could rent it from SEASWA as needed. A regional sharing network overseen by SEASWA could make new equipment purchases more affordable and distribute the burden of maintenance costs. Not all equipment is suitable for such a network (e.g. garbage trucks are needed multiple times a week or even daily, so sharing them across communities would be infeasible) but trailer-mounted equipment like the tire shredder already owned by SEASWA can be used during designated periods to process materials in bulk.

4.4 Regional Landfill

A regional landfill would likely reduce costs for participating communities by reducing shipping distance and giving SE more control over its waste management, as most SE communities that export MSW contract with Republic Services and Alaska Marine Lines to ship to the Pacific Northwest. A regional landfill could be developed and managed by a municipality, SEASWA, or other regional entity and would require sufficient land area in a community willing to receive waste from other communities. Siting the airport may prove challenging because of community opposition, environmental concerns, and logistical considerations such as proximity to a port. The landfill would likely be permitted as Class I or Class II, requiring a liner and leachate collection system to protect public health and the environment.

The City and Borough of Wrangell Public Works Department has expressed interest in exploring Wrangell as potential site for a regional landfill.

4.5 Funding Opportunities

SEASWA can advocate for funding opportunities (e.g. through Denali Commission grants or the state budget) and provide support to individual communities in applying for grant funding to purchase equipment. SEASWA can also coordinate with multiple communities to jointly apply for grant funding, either under the SEASWA umbrella or solely with SEASWA technical support; this is especially useful for communities that are interested in applying for grants but lack the staff capacity and resources to prepare an application. Other options for raising revenue include raising or enforcing utility fees, developing a fund for purchasing equipment, and issuing bonds to pay for large, expensive capital projects.

4.6 Community-Driven Programming

Decentralized, community-driven programs are necessary where a regional approach is too costly. SEASWA should encourage and champion behavioral and cultural norms that emphasize individual waste management, sustainable resource consumption, and reuse. For example, communities could provide litter clean up supplies to interested individuals or host community clean-ups which can foster local pride, leadership, and interest in waste reduction. They can be done in partnership with other entities (e.g. Alaskans for Litter Prevention and Recycling) or done as a component of a backhauling network.

Community-driven waste diversion programs such as community composting networks already exist across SE Alaska, and SEASWA could focus on championing these efforts and advocating to secure additional resources and recognition. Identifying and highlighting case studies of best practices across SE Alaska could support future grant applications. Partnerships with larger entities are also possible. For example, SEASWA could partner with the Department of Natural Resources (DNR) or National Oceanic and Atmospheric Administration (NOAA) to manage marine debris.[12]

4.7 Backhauling

There is a need for regional collaboration to facilitate regular removal of scrap metal and junk vehicles, as well as HHW and e-waste. A regional backhauling system would require a regular schedule to help communities plan. These events also need to have a steady stream of funding and long-term partnerships with public and/or private entities.

The Backhaul Alaska Program coordinates the removal of harmful waste from rural Alaskan communities and builds local capacity through trainings, supply provision, and regional assistance.[13] Backhaul Alaska serves nearly 100 remote communities and has backhauled over 250 tons of waste since 2018, including lead-acid batteries and electronic waste. For example, Backhaul Alaska supported a partnership between Kawerak and Alaska Airlines, to use e-waste in lieu of water ballast on some flights as a

[12] 2025 Alaska Marine Debris Action Plan: https://marine-debris-site-s3fs.s3.us-west-1.amazonaws.com/s3fs-public/publications-files/2025-AKMDAP_Final.pdf
[13] Backhaul Alaska: https://backhaulalaska.org/

form of backhauling. According to the Battery Collection in Action Case Study, [14] Backhaul Alaska demonstrated successful large-scale collection and training even in logistically challenging regions through collaboration on recycling and environmental goals. The program's methods for overcoming transport challenges could serve as a model for other remote locations.

The Backhaul Alaska Program reduces costs and improves efficiency in HHW removal through methods such as streamlined protocols and a single point of contact for communities. SEASWA could partner with Backhaul Alaska as a regional coordinator. As a regional coordinator, SEASWA would help coordinate backhaul activities and shipments, perform site visits and regularly report backhaul activities, provide technical assistance to communities, and participate in regular meetings with regional coordinators across the state. Alternatively, it could independently enter into an agreement or stipend with companies to haul out waste.

5. Conclusion and Next Steps

The recommendations presented in this white paper are based on the analyses and research conducted throughout the span of the Southeast Alaska Regional Municipal Solid Waste Strategy project. SEASWA and SE Alaska communities should approach their MSW management planning using a three-tiered approach: 1) addressing core needs and filling gaps in critical infrastructure; 2) seeking new technologies that are modular, can be maintained by communities, and can deliver multiple benefits such as renewable sources of fuel, lower energy costs, etc., and 3) exploring opportunities for coordination with nearby communities to optimize waste streams and lower shipping costs.

A notable limitation to this paper is that not all communities offered waste profiles or tracked their waste data. To effectively implement regional systems changes, additional engagement and coordination between SEASWA and SE communities is recommended. This coordination will help to fill in knowledge gaps as well as secure public buy-in.

RESPEC will meet with SEASWA and SEC representatives to discuss proposed solutions and SEASWA's desired role in the future of SE solid waste management. Based on this discussion, recommendations will be identified for cost-feasibility and recommended policies will be identified for SEASWA and individual communities, as appropriate.

[14] Battery Collection in Action Case Study: https://www.epa.gov/electronics-batteries-management/battery-collection-action-case-study-backhaul-alaskas-large-scale