



**SPREP**  
Secretariat of the Pacific Regional  
Environment Programme



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# Practitioner's Guideline on Depollution on End-Of-Life Vehicles: Depollution Guideline

February 2023



This guideline is to provide practitioners in the automotive and waste management industries with a comprehensive and practical resource for executing effective depollution processes and aims to encompass the entire lifecycle of an end-of-life vehicles (ELVs), from the initial assessment of hazardous components to the final destination of depolluted and hazardous materials.

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Our vision: A resilient Pacific environment sustaining our livelihoods and natural heritage in harmony with our cultures.

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# PacWaste Plus Programme

The Pacific – European Union (EU) Waste Management Programme, PacWaste Plus, is a 72-month programme funded by the EU and implemented by the Secretariat of the Pacific Regional Environment Programme (SPREP) to improve regional management of waste and pollution sustainably and cost-effectively.

## About PacWaste Plus

The impact of waste and pollution is taking its toll on the health of communities, degrading natural ecosystems, threatening food security, impeding resilience to climate change, and adversely impacting social and economic development of countries in the region.

The PacWaste Plus programme is generating improved economic, social, health, and environmental benefits by enhancing existing activities and building capacity and sustainability into waste management practices for all participating countries.

Countries participating in the PacWaste Plus programme are: *Cook Islands, Democratic Republic of Timor-Leste, Federated States of Micronesia, Fiji, Kiribati, Nauru, Niue, Palau, Papua New Guinea, Republic of Marshall Islands, Samoa, Solomon Islands, Tonga, Tuvalu, Vanuatu.*

## Key Objectives

### Outcomes & Key Result Areas

The overall objective of PacWastePlus is *“to generate improved economic, social, health and environmental benefits arising from stronger regional economic integration and the sustainable management of natural resources and the environment”*.

The specific objective is *“to ensure the safe and sustainable management of waste with due regard for the conservation of biodiversity, health and wellbeing of Pacific Island communities and climate change mitigation and adaptation requirements”*.

### Key Result Areas

- **Improved** data collection, information sharing, and education awareness
- **Policy & Regulation** - Policies and regulatory frameworks developed and implemented.
- **Best Practices** - Enhanced private sector engagement and infrastructure development implemented
- **Human Capacity** - Enhanced human capacity

Learn more about the PacWaste Plus programme by visiting



[www.pacwasteplus.org](http://www.pacwasteplus.org)

# 1 Introduction

## 1.1 Purpose

The main objective of this guideline is to provide practitioners in the automotive and waste management industries with a comprehensive and practical resource for executing effective depollution processes. This guideline aims to encompass the entire lifecycle of an end-of-life vehicles (ELVs), from the initial assessment of hazardous components to the final destination of depolluted and hazardous materials.

By outlining step-by-step procedures, safety measures, and disposal protocols, this guideline seeks to minimise environmental contamination and promote the safe handling of hazardous substances. This guide was developed for PacWastePlus participating countries to address the ELV depollution before being baled and shipped to the designated country where further ELV processing can be done.

The target audience of this guideline are the managers and technicians at the depollution and dismantling site, and other local recycler owner-operators. This guideline does not constitute binding regulation and is developed for advisory purposes alone.

## 1.2 Research

This document was developed with reference to similar guidelines in jurisdictions similar to Pacific Island Countries (PICs). Documents reviewed in the development of this Guideline were:

### **Scottish Environmental Protection Agency (SEPA) and Natural Scotland**

- End-of-Life Vehicles Information for authorised treatment facilities (2014)
- End-of-Life Vehicles (Storage and Treatment) (Scotland) Regulations 2003: Comprehensive guidance (2014)

### **United States Environmental Protection Agency (U.S. EPA)**

- Processing End-of-Life Vehicles: A guide for Environmental Protection, Safety and Profit in the United States-Mexico Border Area (2017)

### **United Kingdom Department for Environment, Food and Rural Affairs (DEFRA)**

- Depolluting End-of-life vehicles (cars and light goods vehicles) Guidance for Authorised Treatment Facilities (2011)

### **United Kingdom Health and Safety Executive (HSE)**

- A guide to the handling and storage of airbags and seat belt pretensioners at garages and motor vehicle repair workshops (2022)

### **Secretariat of the Pacific Regional Environmental Programme (SPREP)**

- Bulky Scrap Metals Recycling Operational Guide (2017)
- The Report on the Educational and Awareness Activities (2016)

### **Australian Department of Climate Change, Energy, the Environment and Water (DECEW)**

- Environmental Impacts of Refrigerant Gas in End-of-Life Vehicles in Australia (2014)

### **Ministry of Environment, Forest & Climate Change, Government of India (MOEF)**

- Guidelines for Environmentally Sound Facilities for Handling and Scrapping of End-of- Life Vehicles (ELVs) (2023)

### **Automotive Recyclers of Canada (ARC)**

- Recycling End-of-Life Vehicles in Canadian Remote Communities (2017)

#### **Scout Environmental**

- A practical Guide to ELV and Sustainable Waste Management in Nunavut (2017)

#### **Environmental Protection Agency (EPA VIC) and Victorian State Government**

- Auto Recyclers Guideline (2020)
- Management and storage of combustible recyclable and waste materials – guideline (2021)

## **1.3 Importance of Cataloguing and Record Keeping in Depollution Process**

Cataloguing and record keeping play an important role in the depollution process of ELVs, as they contribute to the transparency, accountability, and effectiveness of environmentally responsible practices.

Proper documentation ensures that each step of the depollution journey is meticulously tracked, from the initial assessment of hazardous materials to the final disposal or recycling of depolluted components.

1. Cataloguing and record keeping provide a comprehensive overview of the depollution process, facilitating regulatory compliance and audits. Accurate documentation establishes a clear trail of accountability, demonstrating that depollution procedures were executed in accordance with relevant laws and guidelines. This transparency not only builds trust among stakeholders, including regulatory bodies, but also safeguards depollution practitioners against potential legal consequences stemming from non-compliance. Maintaining detailed records allows for informed decision-making and continuous improvement. By documenting the types and quantities of hazardous substances removed, as well as the methods used for disposal and recycling, practitioners gain insights into the effectiveness of their depollution processes. This approach can lead to more efficient, safer, and environmentally sound depollution practices.
2. The systematic dismantling of ELV components is a crucial step to ensure the recovery and recycling of valuable materials (metals and plastics). Skilled technicians carefully disassemble the vehicle, segregating materials into different categories for recycling. Metals such as steel and aluminium are separated and sent to recycling facilities, reducing the demand for virgin resources, and minimising energy consumption associated with primary metal production.

## 2 Tools, Machinery, and Storage Requirements

The equipment needed for depollution and dismantling are described in this section. The primary equipment needed is a depollution bay that will enable technicians to efficiently depollute ELVs at the facility. Two examples of a depollution bay is presented in **Figure 1**.

Figure 1. Dual vehicle depollution bay (top) and Single depollution (below)

Source: autodrain.net



These depollution bays would enable the easy depollution of the vehicles as they can be lifted so that components beneath the vehicle can be removed. An ideal depollution bay would be attached with a funnel where waste liquids can be redirected away from the vehicle into suitable and secure storage containers. The components of a depollution site can be found in **Box 1**.

### Box 1. Components of an ELV depollution site

An ELV depollution rig is a specialised setup designed to carry out the depollution process efficiently and safely on end-of-life vehicles, extracting hazardous materials and components before recycling or disposal. The components of an ELV depollution rig are carefully selected to handle a range of tasks associated with the depollution process. Here's a description of the various components typically found in an ELV depollution rig:

**Vehicle Hoist or Ramp:** A sturdy hoist or ramp is used to lift the ELV off the ground, allowing technicians easy access to the undercarriage and components that need to be removed.

**Drainage Area:** A designated area equipped with catch basins and drainage systems is crucial for collecting and managing fluids during the depollution process, such as oil, coolant, transmission fluid, and more.

**Fluid Extraction Equipment:** Various tools like oil extractors and fluid draining devices are used to efficiently remove fluids from the vehicle, preventing spills and contamination.

**Fluid Storage Containers:** These containers are designed to securely store collected fluids for proper disposal or recycling, minimising the risk of leaks and environmental harm.

**Component Removal Tools:** A range of tools, from wrenches and screwdrivers to specialised equipment, is needed to remove hazardous components safely and efficiently like batteries, mercury switches, lead wheel weights, and more.

**Fluid Recycling and Recovery Systems:** Depending on the type of fluids extracted, recycling systems can help recover valuable materials for reuse, contributing to sustainable waste management.

**Extraction Devices:** Specialized equipment like tire cutters, refrigerant recovery devices, and mercury extraction tools are essential for safely removing hazardous components without releasing pollutants into the environment.

**Waste Separation and Storage:** Properly labelled containers are required for segregating different types of waste, including hazardous and non-hazardous materials. This ensures proper disposal or recycling.

**Personal Protective Equipment (PPE):** Safety gear such as gloves, safety goggles, masks, and protective clothing is crucial to shield technicians from exposure to hazardous substances during the depollution process.

**Environmental Controls:** Ventilation systems and exhaust fans help maintain a safe and well-ventilated depollution area, reducing the risk of inhalation of harmful fumes.

**Documentation Area:** A workspace equipped with computers, forms, and writing tools is essential for technicians to record and maintain detailed documentation of the depollution process, adhering to legal and regulatory requirements.

**Training and Safety Signage:** Clear signage and visual aids remind technicians of safety procedures and guidelines, fostering a culture of safe practices in the depollution facility.

An ELV depollution rig is a sophisticated setup that requires careful planning and adherence to safety protocols to effectively manage the depollution process. The components work in harmony to ensure that hazardous materials are extracted, collected, and stored properly, minimizing the environmental impact, and promoting sustainable waste management practices.

While a depollution bay like the one above is a gold standard for depollution site – they are expensive and may not be affordable for small-scaled recyclers. A cheaper alternative to access the undercarriage of the vehicle without a depollution bay shall require the use of a 4 tonne front end loader (**Figure 2**) to hoist the carriage atop a stack of cinderblocks (**Figure 3**) or a sturdy metal frame (**Figure 4**). The metal frame should be made of heavy gauge steel beams that are welded together and should have an approximate height of 5 feet 7 inches, a width of 6 feet 7 inches, and a length of 7 feet, with cross bracing located on 3 sides of the stand (**Figure 5 and Figure 6**).<sup>1</sup>



Figure 2. Tractor lifting ELV

Source: Scout Environmental (2018). Depolluting End of Life Vehicles: A Refresher. Youtube.com



Figure 3. Placing ELV on cinderblocks

Source: Scout Environmental (2018). Depolluting End of Life Vehicles: A Refresher. Youtube.com



Figure 4. ELV placed on top of a sturdy metal frame

Source: Scout Environmental (2018). Depolluting End of Life Vehicles: A Refresher. Youtube.com

<sup>1</sup> Scout Environmental (2018). Depolluting End of Life Vehicles: A Refresher



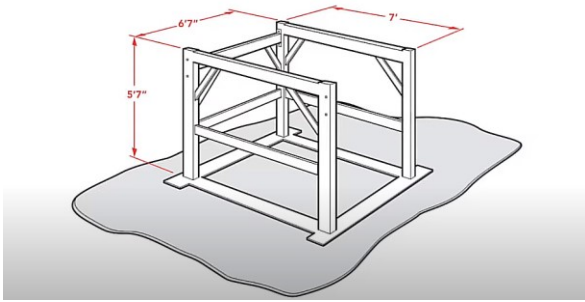


Figure 5. Dimensions of the metal frame  
**Source:** Scout Environmental (2018). Depolluting End of Life Vehicles: A Refresher. Youtube.com

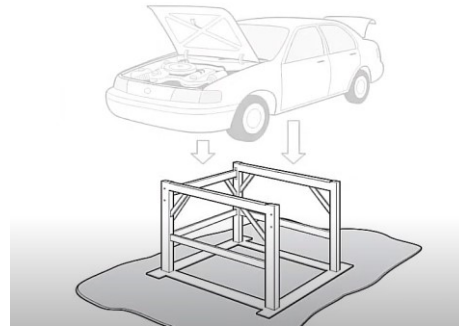


Figure 6. Cross-bracing on steel frame  
**Source:** Scout Environmental (2018). Depolluting End of Life Vehicles: A Refresher. Youtube.com

## General Equipment

The equipment necessary for vehicle dismantling is:

- Wrenches
- Screwdrivers
- Ratches
- Sockets
- Drain pans
- Hammers
- Extension bars
- Wire strippers
- Air blow gun
- Brake



Figure 7. Example Auto Repair Toolkit

**Source:** Amazon.com

This is not meant to be an exhaustive list, but a general list of recommended tools that are used in vehicle dismantling.

## 2.1 Worker Personal Protective Equipment (PPE)

Vehicle dismantling and depollution is potentially dangerous and high-risk activity which carries numerous hazards to the workers due to the handling of hazardous substances.

As such, they will need to be adequately equipped with necessary personal protective equipment (PPE) that is required for them to complete their tasks on-site safely and effectively.

The key PPE and safety items to use when working on ELVs are:

- Helmet/Head protection
- Gloves (e.g., nitrile gloves, reusable leather PPE gloves, high voltage gloves),
- Eye protection (safety goggles and glasses)
  - Safety goggles should be used when dealing with liquid and gaseous hazards.
  - Safety glasses are generally more comfortable.
- Hearing protection (typical earmuffs used in the construction industry)
- Face mask/Visor
- Safety boots (steel-toe with protective sole plates may be desirable)
- Work clothes/Overall wear
- First-aid kit



Figure 8. Example of PPE

These items are to be always worn at the site. Posters promoting minimum safety requirements and wearing of PPE should be placed around the work site. Workers should be encouraged to wash their hands thoroughly prior to eating or smoking, this can be promoted with posters.

These posters should highlight the health hazards from not adhering to the health and safety requirements. PPE should be kept clean to prevent the contact of contaminants against skin.

## 2.2 Selecting Site Requirements

### Location

The ideal location and size of a depollution site for ELVs can vary significantly depending on the number of vehicles to be processed and scale of operation.

As such, there is no single answer, but these are a few general considerations to determine an appropriate location:

- Having additional space can make it easier to scale up operations without the need for significant site redesign that can be costly.
- The site should be situated in an appropriate land use zone (i.e., industrial area) that should be compliant to all relevant regulations. Consider compatibility with neighbouring industrial activities and potential synergies.
- An ideal site would have easy access to major roads, utilities, and vehicles. This will ensure easy accessibility for transportation of ELVs and materials.
- Plan for buffer zones around the site to create a separation between the facility and adjacent properties.
- The site can be indoors or outdoors.

## Environmental and Societal Precautions

- Site selection should be considerate of the potential impacts (e.g., noise and air pollution) to neighbouring communities, with a goal to minimise disturbances.
- The site should be situated away from sensitive environmental areas, such as rivers, wetlands, or forests, and residential areas.
- Proximity to drainage systems or water sources should be minimised to prevent pollution.

## Facilities and Access

- The site should be well ventilated. This can be done by mechanical (e.g., using fans) or non-mechanically (e.g., having open windows). A well-ventilated site limits the circulation of pollutants around the facility. Ideally, the exhaust fan is located close to the worker, with makeup air blowing from behind the worker. This draws contaminated air away from the worker.
- **Figure 9** presents a few examples of appropriate ventilation layouts. Note that the use of table fans alone may circulate fumes and contaminants around the work site without directing them outward.

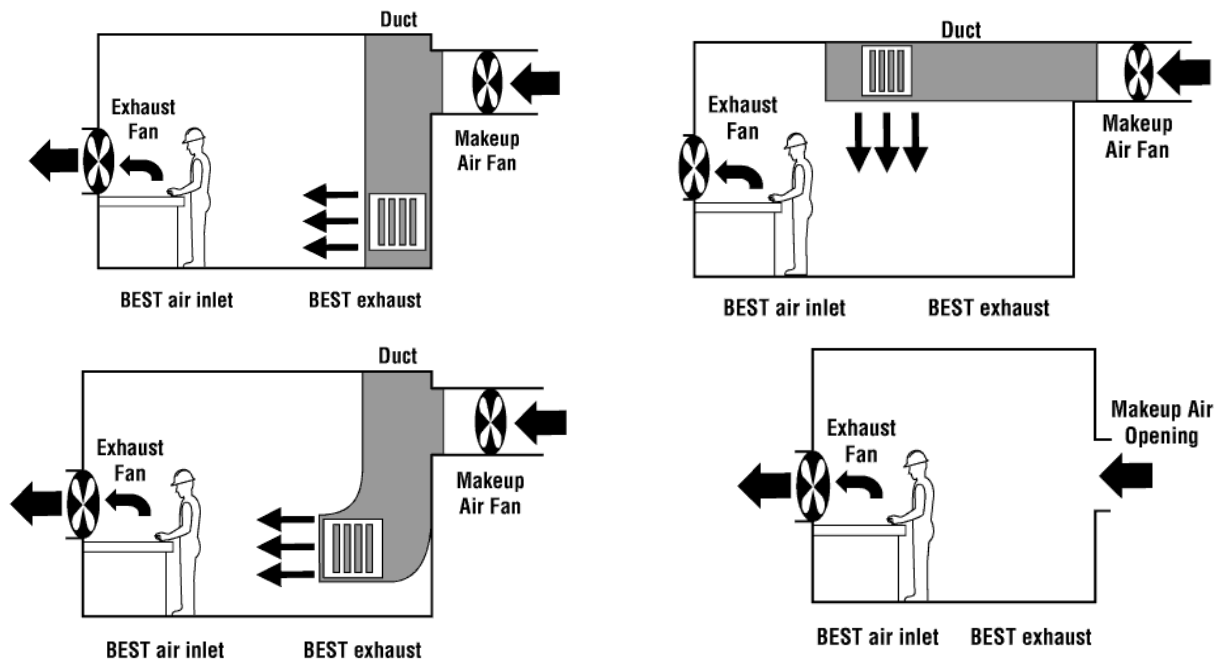


Figure 9. Examples of appropriate ventilation layouts

Source: Canadian Centre for Occupational Health and Safety.

- There should be space allocated for administrative offices where training can be conducted, documents and records can be safely kept.
- Bathrooms and clean drinking water supply for technicians.
- Common resting area to take rest and breaks.
- Surfaces at the site need to be non-permeable such as a concrete floor to prevent the leakage of harmful substances into the environment. Drainage from depolluted vehicles should not be allowed to escape the impermeable surface. If concrete flooring is not available at the site – a polyethylene sheet can be used for this purpose as well (**Figure 10**).
- There should be signages around the facility detailing a clearly labelled floor plan, key hazard areas (e.g., fire), numbers for emergency health and fire services (**Figure 11**).



Figure 10. Polyethylene sheet under an elevated ELV

Source: Scout Environmental (2018). Depolluting End of Life Vehicles: A Refresher. Youtube.com

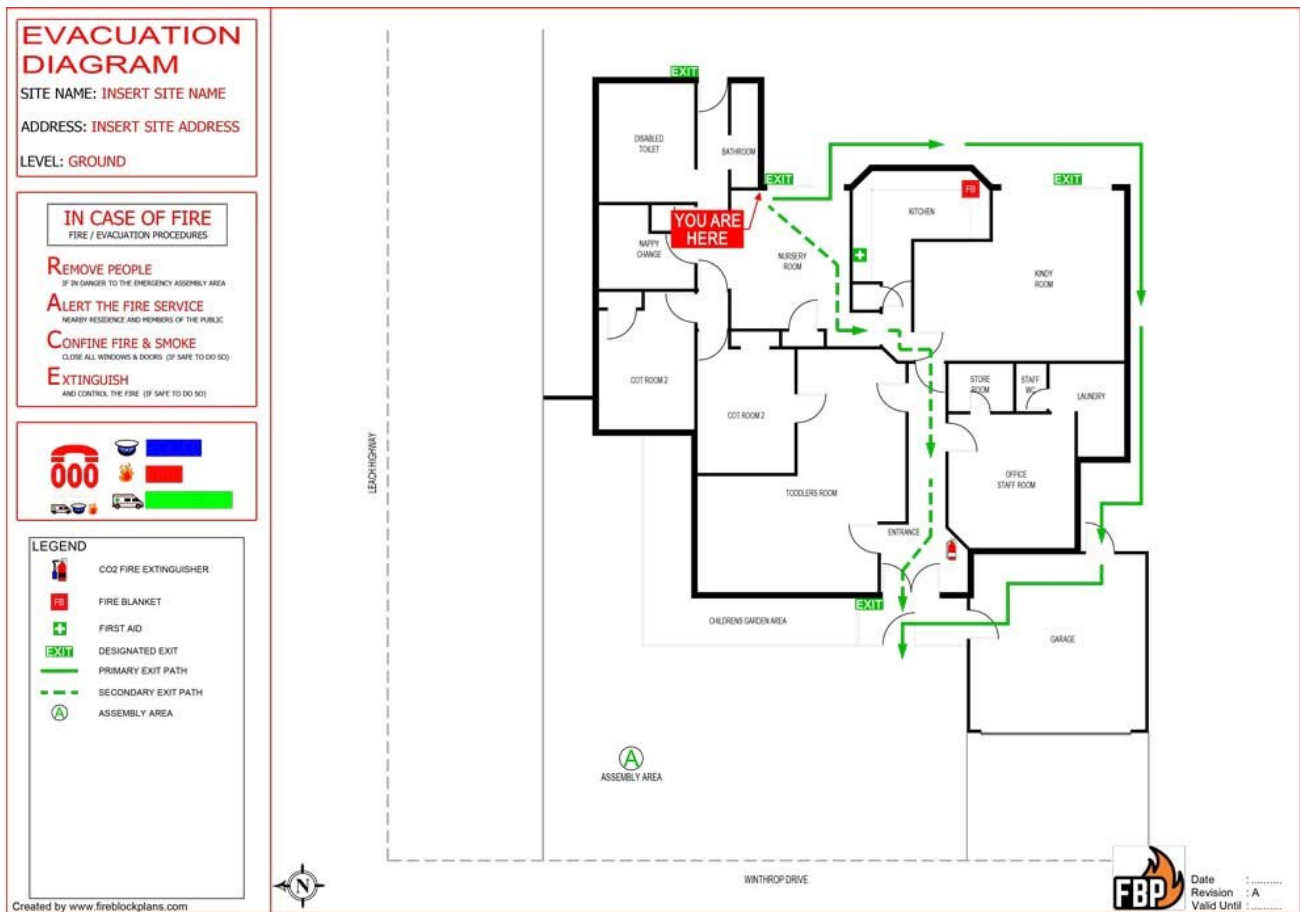


Figure 11. Example of an emergency evacuation plan

Source: fireblockplans.com

## 2.3 Equipment for Removal of Liquids (oils, lubricants, coolants)

Fuels are to be drained and extracted using pumps. One option is the use of small hand pumps **Figure 12** (left). It is recommended that a 45-gallon steel (middle) or plastic drum is used. Antifreeze/coolant needs to be stored in a plastic or steel container for storage.

**Figure 12** (right) provides an example of a plastic container made from durable high-density polyethylene. Other tools that may be needed include pipe pliers, fuel filter sockets, fuel filter wrench etc.

Analysis equipment should be used to identify the type of gas in each ELV (left image in **Figure 13**). If the analysis shows that the identified is highly volatile e.g., propane, then the containers must be handled with specifically trained technicians.

The container equipment used must match the gas identified by the analysis equipment.



Figure 12. Fuel hand pump (left), Fuel module (middle), Plastic container for antifreeze/coolant storage (right)

Source: autodrain.net, Scout Environmental, and melbournesolvents.com



Figure 13. Air conditioning gas checker (left) and gas container for refrigerant (right)

Source: us.msasafety.com

Refrigerant recovery equipment such as the one in **Figure 14** will be required for extraction of coolant from the ELV.



Figure 14. Refrigerant management system

Source: JBTools.com

## Storage Standards

Fluids from ELVs such as oil and lubricants will need to be collected and contained in segregated storage tanks for that purpose alone. Containers containing liquids must be secure to prevent any leakages and liquids such as rainwater from entering them. All containers will need to be clearly labelled.

Refrigerants should be contained in storage containers and never released or vented to the atmosphere as they are important greenhouse gases that have ozone depleting effects and contribute to global warming.

A drum should not be filled to more than 80% of its capacity to allow for expansion and contraction of the container and to comply with transportation of dangerous goods requirements.

A securely sealed plastic tote like the one illustrated in **Figure 16**.

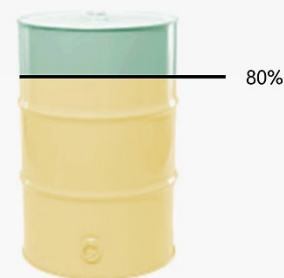


Figure 15. Liquid storage limit for 45-gallon steel or plastic drum



Figure 16. Securely sealed plastic tote for liquids

Source: ITP Packaging

## 2.4 Tools for Battery/Lead Extraction

Tools for battery extraction are mainly adjustable pliers and a wrench (either a crescent wrench, adjustable wrench, or a socket wrench) (see **Figure 17**). A hammer might also be required to loosen the terminal cable from its post.



**Figure 17.** Adjustable pliers (left) and adjustable wrench (right)

Batteries may be stacked and stored in a leak-proof polyethylene container such as the one in **Figure 18**. A container like the one below will allow for the safe transport and storage of batteries. The removal of the battery may also require the de-soldering of connections and cables. Relevant tools are solder wicks and soldering irons, and desoldering pumps.



**Figure 18.** Battery storage polyethylene container  
Source: [export.kaiserkraft.com](http://export.kaiserkraft.com)



**Figure 19.** Soldering iron (left), solder wick (right), desoldering pumps (bottom)

## Lead Storage Standards

It is recommended that batteries be stacked no more than 2 in a column to reduce instability. Cardboard and plywood should be placed between stacks to reduce fire risk. Batteries may also be stored or covered with a leak-proof polyethylene liner under cool and dry conditions such as under cover with a well-ventilated area. Refrain from placing metal objects on top of batteries, and they should also be stored away from other flammable materials and equipment.

## 2.5 Tools for Mercury handling

Mercury collection containers will need to be used to for storage prior to recycling. A container such as the one in **Figure 20** that has a closed lid.



Figure 20. Mercury switch container

Source: Scout Environmental (2017)

## 2.6 Machinery for Tyre Depollution

There are two options available for the effective removal of wheels. The first is a small-scaled tyre handling device as presented on the left of **Figure 21** which reduces the pressure and stress on the technician's back from the heavy load associated with tyre removal. The image on the right of **Figure 21** reduces technician fatigue and risk of injury by reducing human input.



Figure 21. Ergonomic wheel and tyre remover (left) and Wheel popper (right)

Source: autodrain.net

Other equipment such as a jack, wheel wrench, tyre pressure gauge may also be needed.



Figure 22. Car jack (left), Wheel wrench (middle), Tyre pressure gauge (right)

Source: Ebay.com



## Tyre Storage Standards

Tyres should be stored to minimise fire risk. Care should be taken to avoid excessive stockpiling. It is recommended that no more than 2 vehicle loads of tyres are stored in a particular area. The height of the pile should not exceed 3m.

The storage of tyres carries significant fire risk, as the hollow interior of the tyres provides ventilation for flames to grow and spread. Due to this, it is recommended that a sprinkler system should be installed if tyres are to be stored under cover. The operator of the facility should liaise with appropriate planning authorities and fire services as part of a risk assessment for best practice advice.

Tyres stored outdoors should be adequately distant from buildings and the boundary of the facility to prevent the spread of fire. This is especially important if the facility is close to a forest or other vegetation and trees. There should be easy access for firefighters as well. Tyres need to also be stacked in a way to prevent vermin from breeding in them.



Figure 23. End-of-life tyres

Source: esebene – stock.adobe.com

## 2.7 Airbag Removal

As airbags are classified as explosive devices, there is considerable risk involved in deploying them. An air bag deployment tool like the one in **Figure 24** can assist technicians in the safe and efficient deployment and subsequent removal of airbags. A device like the one depicted has a pre-detonation warning alarm and can also be activated at a safe distance. Removal of a non-deployed airbag is not tool intensive, and only requires the use of a hex key, a socket bit, and a screwdriver.



Figure 24. Air bag deployment tool

Source: autodrain.net

## Storing Airbags

Once removed, airbags can be stored in a container which has no exposed steel and can be closed and locked away. The container should be kept away from combustible material such as oils, electricity cables, and areas where welding work is taking place. The containers where airbags are stored should be kept dry at all times and secured to either the floor or wall.

## 2.8 Plastics and Scrap Metals

### Storage standards for plastics and scrap metals

After the ELVs have been dismantled and depolluted, they are ready to be crushed or baled. Plastics from the ELV such as car bumpers and the metal (ferrous and non-ferrous) components of the car bodies should be stored appropriately with the potential hazards in mind:

- Leaching of remaining contaminants not sufficiently drained from the depollution and dismantling process,
- Fire hazards,
- Release of ozone-damaging substances,
- Release of particulate matter into the air.

The storage of these materials should be managed in a way that accounts for these risks. The main concern would be the risk of combustion. It is recommended that the storage site should be monitored for hot spots. High temperatures can be counteracted by introducing moisture by spraying down piles during periods of high fire risk, shading the area, and minimising the size of the pile or stack. Other strategies to minimise fire risk involve storing the combustible material in its largest form before further processing and rotation/turning of the pile.

# 3 Depollution Process for ELVs

## 3.1 Overview of Depollution Process

ELVs pose a significant threat to the environment due to the presence of hazardous materials such as oils, fluids, heavy metals, and other pollutants. The depollution process aims to systematically remove these harmful substances, ensuring proper disposal and recycling of vehicle components while minimizing their negative effects on ecosystems and human health. ELV depollution primarily takes place with the use of a Depollution Rig (**Figure 26**).

The steps of depollution are presented in the **Figure 25** below.

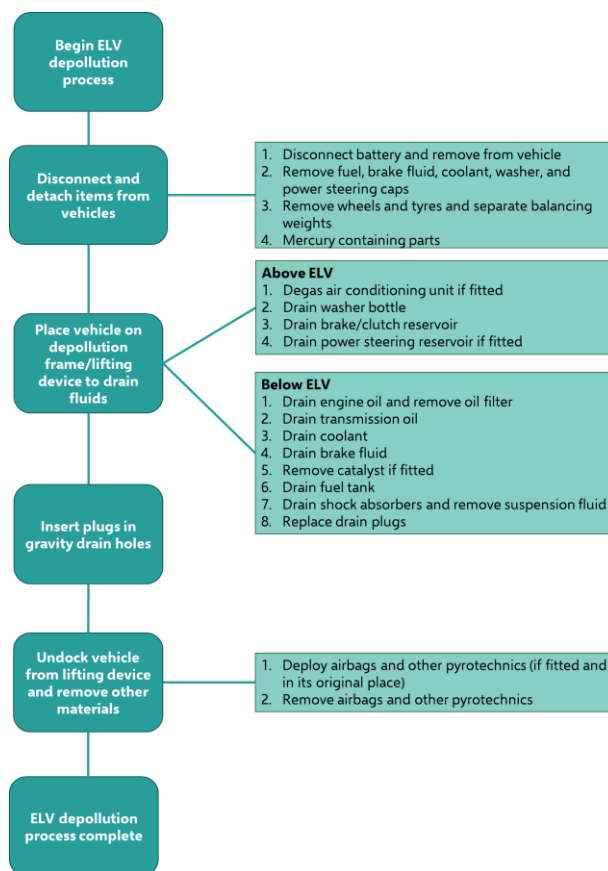


Figure 25. Steps to depollute ELV

The thorough draining and collection of fluids from the ELV, including the extraction of engine oil, transmission fluid, coolant, brake fluid, and other potentially harmful substances is the main element in the depollution process. These fluids must be carefully stored and to prevent leakage and contamination of soil and water sources.

Additionally, refrigerants from air conditioning systems must be safely extracted in a vapour state to prevent their release into the atmosphere, as they contribute to ozone depletion.

Care should be taken in the removal and proper disposal of hazardous components, including airbags, batteries, and catalytic converters. These components contain potentially toxic materials, such as heavy metals and chemical compounds, which must be treated and disposed of according to environmental regulations. This means that they should not be sent to a typical landfill and can only be directed to a hazardous waste facility.

Batteries, for example, are sent to specialised recycling centres to recover valuable materials like lead and plastic.

Figure 27 illustrates the different components in a vehicle.



Figure 26. ELV Depollution Rig  
Source: ELVTraining.com

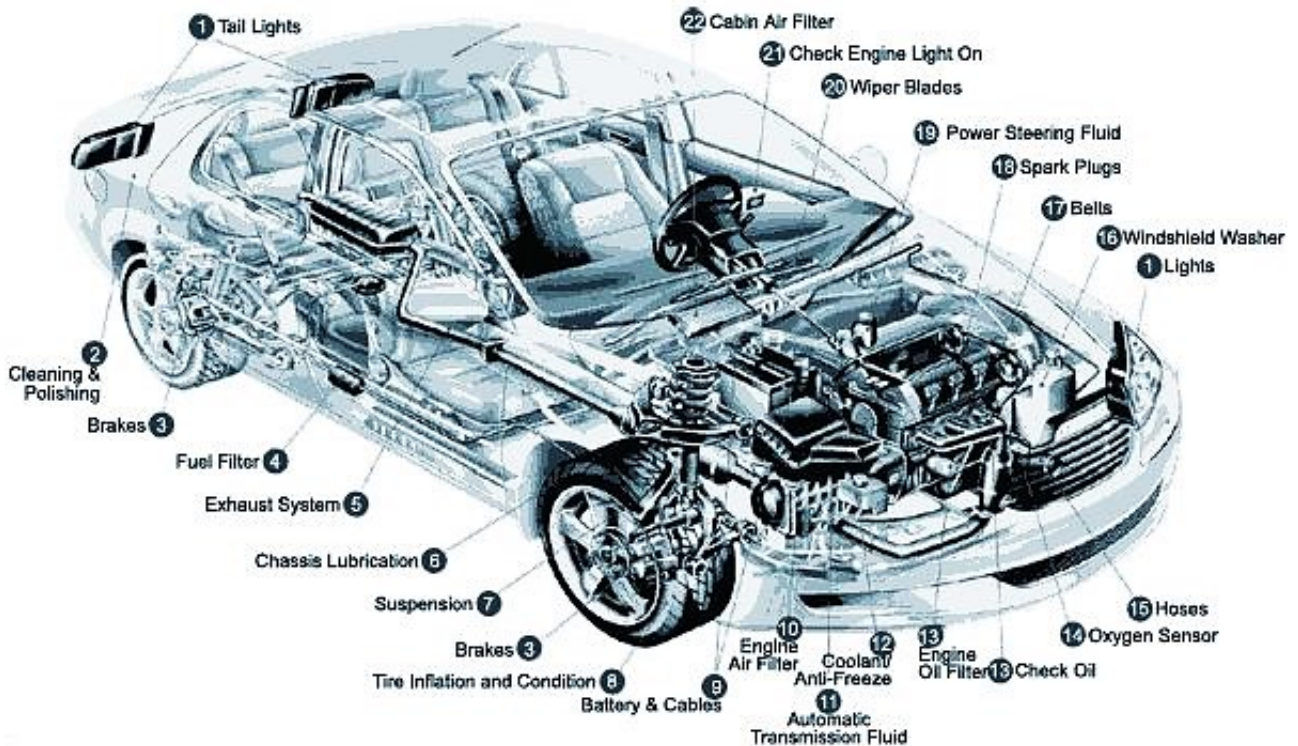


Figure 27. Car parts in a vehicle

Source: [accessriviera.wordpress.com](http://accessriviera.wordpress.com)

## Safety Precautions

Prior to starting any depollution or dismantling activities, technicians must be equipped with appropriate personal protective equipment (PPE), including gloves, safety goggles or glasses, first-aid kits, and protective clothing, to minimise the risk of exposure to hazardous substances. Proper ventilation and good airflow in the depollution area is required to prevent the accumulation of potentially harmful vapours and substances.



Figure 29. Safety glasses (left) and safety goggles (right)

Source: [www.3m.com](http://www.3m.com)

Spills and leaks are to be expected as part of the dismantling and depollution process. It is advised that spill kits be made readily accessible for clean-up. The vehicle processing crew must be trained to use the spill kits should there be a spill. An example of a spill kit is illustrated in **Figure 28**.

To ensure a secure working environment, the facility is equipped with prominently displayed fire hazard safety information at strategic locations. Employees are well-informed about fire hazards and the necessary precautions to take in case of an emergency. Additionally, easily accessible fire extinguishers are strategically placed throughout the facility, adhering to stringent safety standards. These fire extinguishers are regularly inspected and maintained to guarantee their effectiveness in the event of a fire outbreak. The facility will also need to have a building evacuation plan.

## 3.2 Lead Removal

The removal of lead from end-of-life vehicles (ELVs) is essential to prevent environmental contamination and health risks associated with this toxic heavy metal. Common ELV components which contain lead include lead-acid batteries, wheel weights, soldered connections, and leaded glass. Following is a step-by-step process for the safe and effective removal of lead from ELVs:

### Step 1: Vehicle Inspection and Identification

- 1.1. Identify components that may contain lead (see text directly above).
- 1.2. Inspect the ELV to identify the location and types of lead-containing components.
- 1.3. Inspect other components, such as soldered connections, cables, and leaded glass.
- 1.4. Identify lead-containing components that may need removal or special handling.
- 1.4. Continuously use PPE to protect against lead exposure.
- 1.5. Place lead-containing components in designated containers, properly labelled as hazardous waste.



Figure 28. Example of a spill kit with goggles, nitrile gloves, pads, disposal bags

Source: [bradyid.com](http://bradyid.com)

## Step 2: Battery Draining and Disposal

- 2.1. Transport the battery to a designated battery recycling facility for proper disposal and lead recovery.
- 2.2. Do not attempt to open the battery; disassembly and lead extraction should be left to trained professionals. Battery should be kept intact.

## Step 3: Wheel Weight Removal

- 3.1. Use a suitable tool to carefully remove lead wheel weights from the vehicle's wheels.
- 3.2. Place removed wheel weights in a labelled container for later disposal or recycling.

## Step 4: Component Removal

- 4.1. For leaded glass, follow manufacturer guidelines for safe removal or seek professional assistance.
- 4.2. If soldered connections or cables need to be removed, use appropriate tools (e.g., solder iron and wick) to carefully detach them, minimising lead exposure.

## Step 5: Segregation and storage

- 5.1. Segregate lead-containing components from other materials.
- 5.2. Batteries can be stacked on top of each other but there should be a firm layer of cardboard between each stack to prevent batteries from coming into contact with each other.
- 5.3. Store lead-containing components in a secure area to prevent contamination.

## Step 6: Final Inspection to Confirm Removal of Lead

- 6.1. Before finalising the dismantling process, perform a thorough inspection to ensure all lead-containing components have been removed.
- 6.2. Verify that no residual lead dust or fragments are present in the vehicle or its surrounding area.

## Step 7: Documentation

- 7.1. Maintain detailed records of the lead removal process, including dates, components removed, and disposal methods used.
- 7.2. Document compliance with local environmental regulations and guidelines.

## Step 8: Recycling and Disposal

- 8.1. Transport lead-containing components to authorized recycling facilities that can safely recover and manage lead materials. For international shipping of these materials, contact National Approving Authority for either the Waigani Convention or the Basel Convention. List of all Approving Authorities for Pacific Countries is attached.
- 8.2. Ensure that disposal and recycling methods adhere to applicable environmental laws.

### Note

**Waste batteries have value. Care needs to be taken to not significantly damage or crack the casing of the battery. This will cause leakages and recyclers may not be accepting of batteries.**

### 3.3 Lithium Removal

Lithium batteries must be removed from end-of-life electric vehicles.

#### Step 1: Battery Removal

1.1 Disconnect the vehicle's power source and remove any auxiliary loads such as lights or radio that could cause a spark.

1.2 Safely remove the battery from its housing using appropriate tools and techniques, taking care to avoid damaging the battery casing or terminals. As outlined in **Chapter 2.4**, appropriate tools and techniques for safe battery removal include adjustable pliers and wrenches. High voltage gloves should be used when working with the battery.

- Find the negative terminal which is marked by a '-' symbol to remove the negative connector.
- Loosen the nut on the negative terminal with a wrench that fits the nuts and bolts. Given the variability of vehicles in the Pacific, there is no true one-size-fits all wrench, so an adjustable wrench will be useful for this situation. Alternative a wrench kit with multiple attachment sizes can be used as well.
- Remove the connector cables from the battery and push the cables away such that it does not come into contact with the battery.
- Repeat this process for the connector on the positive terminal, marked by a '+' symbol.
- The battery is disconnected after the removal of the negative and positive connectors. There may be a clamp holding the battery in place. The nuts of the clamp can be removed with a wrench.
- After the clamp is unfastened the battery can be lifted out of the vehicle.

**Note:** Depending on the make and model of the vehicle, it may be necessary to cut the body of the car to remove the main drive lithium battery due to deformation of the body. In this case, care should be taken to not cut the main drive lithium battery, high voltage wiring, or other high voltage components.

#### Step 2: Battery Handling and Transport

2.1 Place the removed batteries in a designated container or packaging designed to prevent short-circuiting and protect against impacts, and label appropriately. Placed damaged batteries in separate containers that have their damaged status labelled, they are not to be mixed with non-damaged batteries.

#### Step 3: Battery Storage

3.1 Store the removed lithium batteries in a secure and well-ventilated area away from heat sources, open flames, and direct sunlight. Store them separately from other components removed from the ELV to prevent potential interactions and cross-contamination. Batteries should be covered with a leak-proof polyethylene liner.

3.2. Batteries can be stacked on top of each other but there should be a firm layer of cardboard between each stack to prevent batteries from coming into contact with each other. Batteries should not be stacked more than 2 in a column to prevent instability.

#### Step 4: Transport and Recycling/Disposal

4.1 Arrange for transportation of the collected lithium batteries to a licensed recycling facility or hazardous waste disposal site and adhere to all transportation regulations for hazardous materials, including proper labelling and packaging requirements.

### 3.4 Refrigerant Extraction

Extracting refrigerants from end-of-life vehicles (ELVs) is a critical step to prevent environmental harm and ensure compliance with regulations regarding hazardous substances. It is advisable that the national focal point for the Montreal

Protocol on Ozone Depleting Substances is consulted prior to storage, transport, removal, and export of refrigerants from ELV. Here is a detailed step-by-step process for the safe and efficient extraction of refrigerants from ELVs:

### **Step 1: Refrigerant Identification**

1.1. Begin by identifying the type of refrigerant used in the vehicle's air conditioning system. Refrigerants can be found in the car AC compressor. Common residual refrigerants in ELVs after they are taken off the road are HFC 134-a, HC-290, and CFC-12. Refrigerants can be found in the compressor.

1.2. Refer to the vehicle's service manual, the National ODS Unit or consult online resources to determine the specific refrigerant used.

### **Step 2: Refrigerant Recovery Equipment Setup**

2.1. Connect the refrigerant recovery equipment to the vehicle's air conditioning system according to the manufacturer's instructions. These instructions can be found on the manufacturer's website.

2.2. Make sure all connections are secure and sealed to prevent leaks during the extraction process.

### **Step 3: Refrigerant Extraction**

3.1. Begin the refrigerant extraction process by operating the recovery equipment. The equipment will initiate a vacuum and start removing the refrigerant from the system. The refrigerant storage container will need to match the refrigerant identified from the analysis system.

3.2. Monitor the recovery equipment's gauges to ensure that the refrigerant is being effectively extracted.

3.3. Allow the equipment to complete the extraction process, ensuring that as much refrigerant as possible is recovered.

*Note: If refrigerants are planned to be sent for destruction, then they can be mixed in a single container.*

### **Step 4: Sealing the System**

4.1. Once the extraction is complete, use appropriate tools to seal the vehicle's air conditioning system to prevent any further loss of refrigerant.

4.2. Close the vehicle's doors and windows after sealing the system.

### **Step 5: Refrigerant Transfer and Storage**

5.1. Transfer the recovered refrigerant to labelled and sealed storage containers specifically designed for refrigerant storage. The National ODS Unit can be contacted to determine suitable refrigerant storage in the country.

5.2. Store the containers in a secure, well-ventilated area away from direct sunlight and potential sources of heat.

### **Step 6: Recycling and Disposal**

6.1. Transport the recovered refrigerant to authorized refrigerant recycling facilities for proper processing and reclamation.

6.2. Dispose of any waste refrigerant containers or materials according to local hazardous waste disposal regulations.

## **3.5 Mercury Collection and Disposal**

### **Step 1: Collection and Disposal**

1.1. Locate all mercury switches in the vehicle – they can be found in the hood or the trunk of the vehicle as part of the lighting assembly and the anti-lock braking systems (ABS).

1.2. Dismantle the lighting assembly to remove the mercury switch and place in the appropriate collection container.



1.3. Locate the ABS G-Force sensor, remove it, and place it in the appropriate collection container. Switches are to be kept intact.

## **Step 2: Component Storage and Labelling**

2.1. Place removed mercury-containing components in designated, sealed containers that are properly labelled as hazardous waste.

2.2. Use secure containers to prevent potential mercury leakage and cross-contamination.

## **Step 3: Mercury Vapor Control**

3.1. Seal the containers tightly to minimize the escape of mercury vapours.

3.2. If necessary, use absorbent materials designed for mercury vapor control within the containers.

## **Step 4: Recycling and Disposal**

4.1. Transport mercury-containing components to authorized recycling or disposal facilities equipped to manage mercury-containing waste.

## 3.6 Oil and Lubricants Removal

### Step 1: Draining Fluids

1.1. Locate all fluid reservoirs within the vehicle, including:

- brake fluid,
- engine oil,
- transmission fluid,
- power steering fluid,
- and other lubricant compartments.

1.2. Begin with the engine oil: Place a container under the oil drain plug to capture the flow of oil and carefully remove the plug using a suitable wrench. Allow the oil to drain completely into the container. Separate containers are to be used for the different fluid reservoirs listed above.

1.3. Repeat the draining process for other fluid reservoirs, such as transmission and differential fluids, ensuring each container is correctly positioned to collect the fluids.

### Step 2: Fluid Collection and Storage

2.1. Collect the drained fluids in separate labelled containers to prevent cross-contamination. Use dedicated containers for each type of fluid (e.g., engine oil, transmission fluid).

2.2. Seal and properly label each container with the type of fluid and the date of collection. Store the containers in a secure area to prevent leakage or accidental spills.

### Step 3: Component Cleaning

3.1. Wipe down components and surfaces that come into contact with fluids to remove any residual contaminants. Use lint-free towels or rags.

3.2. Dispose of used towels and rags as hazardous waste, following local regulations.

### Step 4: Final Inspection

4.1. Inspect the vehicle's components, ensuring no visible traces of fluids remain.

4.2. Verify that all fluid reservoirs are empty and free of residual contaminants.

### Step 5: Documentation

5.1. Maintain detailed records of the depollution process, including the types and quantities of fluids removed, depollution date, and the responsible technicians.

5.2. Document disposal methods used for fluids and hazardous waste, ensuring compliance with applicable environmental regulations.

### Step 6: Proper Disposal

6.1. Transfer collected fluids to appropriate recycling or disposal facilities authorised to handle hazardous materials.

6.2. Follow local regulations and guidelines for the proper disposal of containers and hazardous waste.

## 3.7 Tyre Depollution

### Step 1: Deflation

- 1.1. Using a suitable valve stem removal tool, deflate each tyre by releasing the air pressure.
- 1.2. Ensure that the tyre is fully deflated to facilitate further processing.

**Note:** Steps 2-4 are only applicable to operations with funding to purchase equipment that can make this process more efficient, as manual removal of tyres from rims can be very labour intensive. It might be otherwise more cost-effective to collect and send the tyres over to a specialised facility.

### Step 2: Removal of Rims

- 2.1. If the tyres are mounted on rims, use appropriate tools to remove them.
- 2.2. Set aside the rims for separate processing or recycling.

### Step 3: Tyre Separation

- 3.1. Carefully separate the tyres into different categories based on their condition and type.
- 3.2. Check for damage, wear, and signs of punctures that may affect the depollution process. Group tyres that are in good condition for potential reuse or resale.

### Step 4: Cutting for Recycling

- 4.1. If tyres are deemed unfit for reuse after 5.2, use a tire cutting machine to cut them into manageable sections.
- 4.2. The cut sections can be transported more efficiently and are suitable for recycling purposes.

**Note:** Tyres should not be cut off rims, but only after they have been removed. Tyres can also be left on rim for transport and recycling.

### Step 5: Steel Belt Removal

- 5.1. For tyres with steel belts, use specialised equipment to remove the steel wiring from the rubber.
- 5.2. Collect the steel wires for recycling.

### Step 6: Proper Categorisation and Storage

- 6.1. Group the removed tyres, steel wires, and rims in clearly labelled containers based on their intended destination (e.g., recycling, resale, disposal).
- 6.2. Store the containers in a secure area to prevent contamination and ensure proper handling.

### Step 7: Documentation

- 7.1. Maintain accurate records of the tyre depollution process, including the number of tyres removed, their condition, and their subsequent handling.
- 7.2. Ensure compliance with relevant environmental regulations and guidelines throughout the process.

### Step 8: Storage

- 8.1. A sprinkler system should be installed overhead if tyres are stored under cover. Facility operators should contact planning authorities and fire services as part of a risk assessment.

8.2. Tyres stored outdoors should be placed in a manner that considers the boundary of the facility and other buildings to mitigate the spread of fire. See **Section 2.6** for a discussion.

### **Step 9: Recycling and Disposal**

9.1. Contact local authorities on options for safe disposal of End-Of-Life Tyres.

9.2. Transport the removed tyres, steel wires, and rims to authorized recycling facilities or outlets.

## **3.8 Airbag Removal**

Airbags can either be deployed in-situ or removed if they cannot be deployed in-situ. The vehicle should be undocked from the lifting device during the airbag removal process.

### **Step 1: Depower airbags and identify Airbag location**

1.1 Determine the locations of airbags within the vehicle, including driver-side, passenger-side, side-curtain, and any other types of airbags present.

### **Step 2: Remove Airbags**

2.1 Once depowered, remove any covering panels to access the airbag module.

2.2 Disconnect the airbag connectors by releasing retaining clips or locks.

### **Step 3: Handling and disposal**

3.1. Place the removed airbag module in a labelled, sealed container designated for hazardous waste.

3.2. Seal the container securely to prevent accidental deployment during storage and transportation.

# 4 Handling and Transport of Residuals

The various fluids and materials described above are hazardous and special handling procedures are required in accordance with domestic regulation. It may be the case that the countries where depollution are taking place lack the facilities to process these waste streams and as such, may require the transport to other countries for proper disposal.

## 4.1 Transport

The use of an incinerator to dispose of the residual waste e.g., refrigerant gases from the ELVs may not be possible in PICTs for a range of reasons e.g., lack of economic viability, air pollution and health impacts. Consequently, they may need to be shipped internationally to other countries for proper disposal and specialist recovery.

The transport of these hazardous waste products to other countries are managed under the provisions stipulated under the Waigani Convention<sup>2</sup> which is based on the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes.<sup>3</sup> The terms of these conventions apply only to parties of the conventions as either shipper or receivers passing through party territorial waters. The appropriate transport authorities (marine or road) should be contacted prior to transport of these materials to ensure that they are properly handled.

We refer to the *Updated General Technical Guidelines for the Environmentally Sound Management of Waste consisting of, containing, or contaminated with persistent organic pollutants (POPs)*<sup>4</sup> for recommendations on packaging and transport of these products.

The responsibility of following these guidelines fall on the exporting party.

- Containers must be inspected for leakages, rust, holes, and other vulnerabilities prior to shipping for transport. Replacements are necessary where these vulnerabilities have been identified.
- Containers that are in deteriorating condition should be replaced as they are considered unsafe for transport. Alternatively, they should be encased in another container that is sound and sturdy.
- Products to be clearly labelled, describing the contents within and appropriate hazard level.
- Lead-acid batteries must be labelled and transported as hazardous goods
- Transportation of the waste products will need to be done by companies that are certified carriers of hazardous materials with qualified personnel involved.
- Storage of POPs waste should be segregated, unless there has been approval granted for joint storage.

The transport of materials for cost recovery e.g., recyclable parts, scrap metals for recycling, fuel, catalytic converters are also subject to the same requirements above.

<sup>2</sup> <https://www.sprep.org/convention-secretariat/waigani-convention#:~:text=The%20Convention%20to%20Ban%20the,force%20the%2021st%20October%202001.>

<sup>3</sup> <https://www.unep.org/resources/report/basel-convention-control-transboundary-movements-hazardous-wastes>

<sup>4</sup> <http://www.basel.int/Portals/4/Basel%20Convention/docs/pub/techguid/tg-POPs.pdf>

# Appendix: General Vehicle Depollution Checklist

A simple checklist presented in the following table can be used to evaluate whether the vehicle has been successfully and completely depolluted prior to further processing. Each vehicle processed should have its own checklist and this should ideally be digitally captured for ease of record keeping.

Table 1. General depollution checklist

Administration		
<b>Name of technician:</b>	Name of officer:	
<b>Record keeping</b>	Recording age, model, and numberplate of vehicle into a log (ideally digitised)	<input type="checkbox"/>
<b>Location</b>	<b>Material</b>	<b>Done?</b>
<b>Under the hood</b>	Remove battery	<input type="checkbox"/>
	Remove fuel filter cap and oil filler	<input type="checkbox"/>
<b>Around the wheels</b>	Remove wheels, tyres, and separate lead balance weights	<input type="checkbox"/>
<b>Under the hood and under the car</b>	Remove parts containing mercury	<input type="checkbox"/>
<b>Location</b>	<b>Material</b>	<b>Done?</b>
<b>Under the hood</b>	Degas refrigerants	<input type="checkbox"/>
	Drain brake fluid	<input type="checkbox"/>
	Drain power steering fluid	<input type="checkbox"/>
	Drain windshield water fluid	<input type="checkbox"/>
	Remove mercury switch	<input type="checkbox"/>
<b>Under the car</b>	Remove coolant	<input type="checkbox"/>
	Remove mercury switch (ABS)	<input type="checkbox"/>
	Drain engine oil	<input type="checkbox"/>
	Transmission fluid	<input type="checkbox"/>
	Drain differential oil	<input type="checkbox"/>
	Drain gas or diesel	<input type="checkbox"/>
<b>In the trunk</b>	Remove mercury switch	<input type="checkbox"/>
<b>Location</b>	<b>Description</b>	<b>Done?</b>
<b>Interior</b>	Deploy and remove airbags and other pyrotechnics	<input type="checkbox"/>

Item	Note



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