Stormwater Best Management Practice

Municipal Vehicle and Equipment Washing

Minimum Measure: Pollution Prevention/Good Housekeeping for Municipal Operations
Subcategory: Municipal Activities

Description

Municipal vehicle and equipment washing can generate dry weather discharges contaminated with sediment, detergents, oils, grease and heavy metals. Both commercial and residential vehicle wash water can contain contaminants from vehicle fluid leaks, typical vehicle wear and the cleaning process itself. A study in a single city in Washington (City of Federal Way, 2009) estimated that vehicle washing had an annual contribution of:

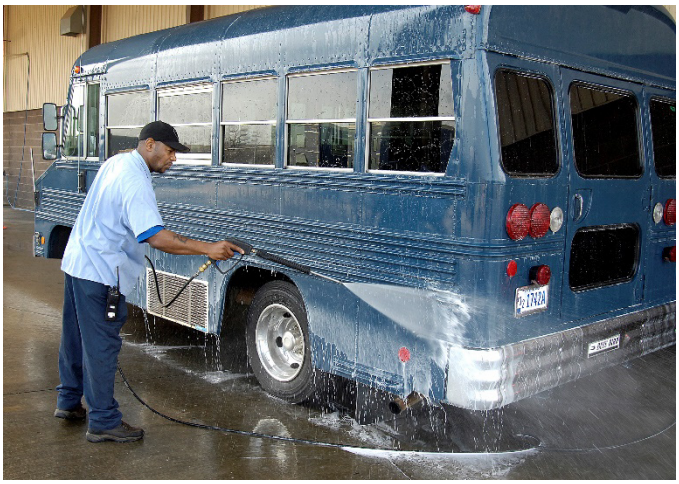
- 190 gallons of gasoline, diesel and motor oil
- 14 pounds of dissolved copper
- 400 pounds of phosphorus and nitrogen
- 60 pounds of ammonia
- 2,200 pounds of surfactants
- 3,000 pounds of solids

The impacts of these constituents discharging to downstream waterbodies can include increased toxicity to living organisms, increased eutrophication and reduced oxygen levels. Therefore, properly addressing these non-stormwater sources using pollution prevention/good housekeeping and other practices is an important component of a stormwater program to eliminate the impacts of these discharges.

Properly implemented vehicle and equipment washing practices can reduce wash water impacts by minimizing or preventing contaminated wash water discharges to downstream waters. They can also help municipalities meet general sustainability goals. For instance, incorporating water recycling systems reduces overall water usage—especially important in dry areas or during periods of drought.

Applicability

Municipalities typically operate fleets of vehicles (e.g., public works trucks, fire trucks, ambulances, police cars, school buses) that they regularly wash and maintain. Municipalities with large fleets might operate their own washing facilities, while municipalities with small fleets might find it more economical to contract with commercial car washes.



Vehicle and equipment washing can contribute significant amounts of pollutants to stormwater if washwater is not properly captured and treated.

Photo Credit: Margo Wright/U.S. Air Force

In addition to the general washing practices discussed here, there are a number of related activities that other fact sheets discuss in more detail that may be helpful for municipally owned/operated vehicles/equipment or to share with contractors who manage such vehicles/equipment:

- For municipalities that own and operate concrete trucks, see the Concrete Washout fact sheet for more information on proper washout techniques.
- For municipalities that own and operate salt spreading equipment, see the Deicing Material Application and Storage fact sheet for more information on proper maintenance and storage of equipment.
- For municipalities looking to reduce the impacts of vehicle washing by the general public, see the fact sheets for Residential Car Washing and Developing Outreach Strategies for Residents and Businesses on the BMPs for Stormwater-Public Education page.

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Siting, Design and Operational Considerations

To limit impacts to downstream waters, municipalities should contain, treat or reuse vehicle and equipment wash water.

- For containment, a municipality can build drainage features that direct wash water to containers, sumps or a treatment system.
- Treatment systems (which regulations often require if a facility discharges wash water to sanitary sewers and subsequently municipal treatment plants) generally include oil/water separators or some type of filtration.
- Sometimes a facility can use more advanced treatment practices if it intends to reuse wash water on-site—a practice that not only limits discharge impacts but also reduces water consumption.

For all practices, municipalities should consider local regulatory requirements. These may include pretreatment requirements from the local sewer authority or specific containment requirements for wash areas in wellheads or water supply protection areas.

Wash Areas

Wash areas (sometimes called wash racks) are designated areas—gratings, raised platforms, bermed areas, etc.—that incorporate drainage systems of some type to allow for containment and collection of wash water. When installing a wash area, a municipality should use paving to minimize loss of wash water and a berm or sloping to contain and direct wash water to a sump. It may connect the sump to the sanitary sewer or to a holding tank, process treatment system, or enclosed recycling system. For a sanitary sewer connection, the municipality would seek the permission of the sewer authority before discharging (because wash water may have special treatment requirements). Alternately, the municipality could design the wash area to recycle wash water, thereby eliminating pretreatment costs and discharges.

If municipal staff need to wash a vehicle outside a facility plumbed to the sanitary sewer, they should avoid direct discharges to storm drain systems. For a small job, they can use a bermed wash area and capture the wash water with a wet/dry vacuum for discharge to a sanitary sewer. For a larger job, they can use a combination of berms and a vacuum truck (such as those used to clean storm and sanitary sewer systems) to capture and safely dispose of wash water. If they use detergents, they should clean pavement to avoid discharging those detergents during the next storm event. Green infrastructure practices like bioretention systems, vegetated filter strips or stormwater wetlands can also help reduce stormwater impacts from wash area overflows. For wash areas that drain directly to storm drains, catch basin modifications can be a low-cost way to contain wash water without replumbing entire drainage systems.

Non-Structural Considerations

The following examples of good housekeeping practices can minimize the risk of contamination from vehicle wash water discharges (adapted from CASQA, 2003):

- Wash all vehicles in areas designed to collect and hold wash water before its discharge to the sanitary sewer system.
- Clearly mark the designated wash area.
- Cover the wash area when not in use to keep out rainwater.
- Perform cleaning activities over an impermeable ground surface (e.g., concrete or asphalt).
- Avoid detergents whenever possible. If detergents are necessary, use phosphate-free, non-toxic, biodegradable soap. If you are using an oil/water separator for pretreatment before discharge to the sanitary sewer, source quick-break degreasers and monitor the oil/water separator output for effectiveness.
- Use a high-pressure hose nozzle to reduce the need for soaps and detergents.
- Municipal facilities that store vehicles should stencil their storm drains to remind employees to wash vehicles within designated wash areas. They can also post signage with this message.
- Mount spill kits with absorbent containment materials and instructions near wash racks. Immediately contain and clean up all spills.
- Train employees in proper vehicle washing and water management procedures; make sure they get regular refresher training.
- In some regions, the dry weather season (lowest stream flows) coincides with fish spawning, when aquatic populations are especially sensitive (EPI, 2007). If possible, schedule outdoor equipment washing and other potential contamination-causing work outside the highest-risk months for the area.

Commercial Car Washes

Municipalities can negotiate with commercial car washes and steam cleaning businesses to handle their fleet vehicle washing. This option eliminates the cost of building and the liability of operating a wash facility. It may only be available for smaller vehicles, since many car washes do not have bays large enough to handle buses, fire trucks, ambulances and other large vehicles.

Maintenance Considerations

Municipal staff should periodically inspect and clean a wash rack's paved surfaces and sump to remove buildups of particulate matter or other pollutants. Plumbing, recycling and pretreatment systems also need periodic inspection and maintenance. Staff should visually inspect the area surrounding the wash rack for leaks, overspray or other signs of ineffective containment due to faulty design or physical damage to berms. They should correct any defects.

Limitations

If the appropriate facilities are available, vehicle washing measures are relatively inexpensive. However, if a municipality needs to build new facilities, implement new structural practices or use outside services, funding can be a limitation. Building a new wash rack can be expensive, and facilities that cannot recycle their wash water might face significant costs for pretreating wash water before discharge to the sanitary sewer. For municipalities using off-site commercial vehicle washing facilities, the employee and equipment time lost during travel to and from approved locations and wait times at wash locations may also be a limitation (CTC & Associates, 2016).

Effectiveness

Although direct measurement of the effectiveness of good housekeeping practices is not common, studies have shown that certain related practices can address common contaminants in vehicle wash water. Combined with good housekeeping practices discussed above, several green infrastructure practices can greatly reduce stormwater impacts. Rain gardens can effectively remove or degrade surfactants—a common constituent of soap—and remove more than 90 percent of total suspended solids (Bakacs et al., 2013). Stormwater wetlands can also effectively remove contaminants like sediments, nutrients and heavy metals (Clary et al., 2017).

Using designated washing facilities can also result in significant water savings. A commercial car wash uses up to 60 percent less water in its entire wash cycle than just the final rinse step of residential hand washing (MASSDEP, n.d.).

For both pollutant reduction and water savings reasons, communities that establish municipal washing facilities or even commercial car washes for the public can reduce impacts to their local water resources. For example, the community of St. Albans, West Virginia, constructed a charity car wash station to reduce residential washing impacts and serve as a model for communities throughout the state. The station directs wash water into permeable pavers and adjacent rain gardens and vegetated areas (WVDEP, 2016). Not only does the facility reduce stormwater impacts, it provides an opportunity to educate the public on local stormwater problems and solutions.

Cost Considerations[1]

As discussed above, a range of non-structural and structural practices are available for vehicle and equipment washing. Costs vary widely, from low-cost, non-structural practices like proper employee training and chemical storage to high-cost, capital improvement projects such as installing new wash areas.

[1] Prices updated to reflect inflation; reported in 2020 dollars. Inflation data obtained from the Bureau of Labor Statistics CPI Inflation Calculator website: https://data.bls.gov/cgi-bin/cpicalc.pl

Non-structural Practices

Adopting "green" cleaning chemicals (biodegradable, non-corrosive, non-toxic) is a low-cost way to reduce discharge of hazardous chemicals. These more environmentally friendly chemicals may also be less corrosive to both vehicles and wash area equipment, providing further savings for long-term maintenance. In addition, regular maintenance and inspections by municipal staff in vehicle washing work areas can identify water or chemical leaks, which may save on operating costs or potential fines.

Structural Practices

The cost of structural practices depends on site needs and constraints as well as system scale and design. The table below provides ranges of various practices.

Practice	Cost Range	Factors That Affect Cost	Source
Berm construction	$700 to $6,000	Wash area size, berm height	CASQA, 2003; MPCA, 2009
Drainage retrofits	$7,000 to $35,000	Drain line type, size, depth and length	CASQA, 2003; MPCA, 2009
New fleet washing facility (installation)	$25,000 to $2,500,000	Fleet size, fleet type, targeted pollutant	CTC & Associates, 2016
Treatment or recycling system (installation)	$40,000 to $250,000	Wash area size, targeted pollutant	CASQA, 2003; MPCA, 2009
Wash bay (annual operating costs)	$3,000 to $5,500	Wash area size, equipment age and type	CTC & Associates, 2016
Commercial car wash (contract rate)	$13 to $55 per truck	Truck type, location	CTC & Associates, 2016

Additional Information

Additional information on related practices and the Phase II MS4 program can be found at EPA's National Menu of Best Management Practices (BMPs) for Stormwater website

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Disclaimer

This fact sheet is intended to be used for informational purposes only. These examples and references are not intended to be comprehensive and do not preclude the use of other technically sound practices. State or local requirements may apply.