

Snowplow Truck Washing Practices

Synthesis Report



research for winter highway maintenance

CTC & Associates LLC

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Executive Summary

Snowplow trucks take a beating during the winter maintenance season, particularly from the salt that is essential to many winter operations. Transportation agencies are looking for cost-effective, environmentally sensitive practices that produce clear results in reducing or preventing corrosion on snowplow trucks and prolong the life of winter maintenance equipment.

This synthesis used a national survey of state department of transportation (DOT) winter maintenance experts to gather information about one way DOTs fight the effects of salt and winter weather on winter maintenance equipment—the use of an in-house wash bay. The synthesis also gathered limited information about the use of other truck washing alternatives; the results of a literature search supplemented the survey findings.

Truck Washing Practices

The survey asked respondents to indicate which of three truck washing practices they use: in-house wash bays, off-site commercial washing facilities, or in-house washing without a wash bay.

All 33 states do at least some washing in-house, and many respondents use more than one practice. Almost three-quarters of the 37 respondents from 33 states use in-house wash bays. Slightly more—a full three-quarters of respondents—wash trucks in-house without a wash bay. Only eight respondents reported the exclusive use of in-house wash bays, and 10 exclusively wash trucks in-house without a bay. Only six states reported using commercial washing facilities, and no state uses commercial facilities exclusively; all six also do some in-house washing as well.

Wash Bay Details and Features

The number of wash bays maintained by each responding state varied widely, from four in Delaware to 200 in California. Two-thirds of respondents reported 50 or fewer wash bays. Comparing the number of wash bays state-to-state is challenging given the number of respondents providing district- or region-level data, and the variability in the roadway networks, populations and climates of the responding states.

The typical wash bay described by respondents is a permanent, lighted, nonautomated, indoor wash bay, almost equally likely to be new construction or a retrofit of an existing space. Eight respondents reported use of pull-on/pull-through wash bays. Respondents from three states—Alaska, Delaware and New Jersey—described at least one fully automated wash bay now in operation or planned.

Respondents' free-form descriptions of their wash bays varied significantly in their descriptive detail, and a review of their responses identified few common elements or practices. The most commonly reported piece of wash bay equipment is the power or pressure washer. Fewer respondents reported the use of other types of wash bay equipment or inputs, such as a handheld wand, an underbody wash, a steam generator, heated water and chemical treatments. More information about the chemical treatments respondents use to remove excess salt and salt residue, and prepare equipment for summer storage, appears in the Literature Search section of this synthesis.

To augment respondents' descriptions of wash bay equipment, inputs and setups, a literature search identified systems and products that could be used by state DOTs, including portable wash racks and interior and exterior washing pads. A small sampling of the automatic truck wash systems and wash bay components used by respondents (pressure washers and steam generators) are highlighted in the Literature Search section of this synthesis.

Wash Timing

An overwhelming majority of respondents—80 percent—use their wash bays both day and night. Only Maine DOT reported using wash bays exclusively during nighttime hours. Most respondents—more than half—wash their snowplow trucks after each event during winter operations. Only four respondents wash trucks daily or after every shift. Many respondents noted that a washing schedule can be disrupted by frequent winter events.

When asked about the time it takes to complete a wash cycle, only eight respondents provided a specific time period for manual washing. Time frames ranged from 15 minutes in Pennsylvania to up to one hour in Connecticut, with 30 minutes the most common time given for manually washing a snowplow. Only two respondents reported cycle times for automatic wash bays—a one- to two-minute wash cycle in Alaska, and a five-minute cycle in Delaware. Other respondents noted that washing times vary, sometimes depending on truck size.

Washing Practices

While a few respondents described their typical truck washing practices in some detail, only Tennessee DOT provided documented procedures that describe how staff should clean a variety of truck types (see [Appendix E](#)). Some states reported on what appear to be unique practices. For example, in Kansas, where state regulations prohibit the washing of trucks without a wash bay, a hoist lifts the truck's hopper to allow for washing of both the truck bed and hopper with a high-pressure, hot-water wash. A few states reported on the use of commercial chemical treatments to remove excess salt and salt residue. Other states use safety rinses, which involve cleaning windows, mirrors and lights during a storm to ensure that drivers can continue to safely operate the plow.

Wash Bay Installation

Sixteen states reported plans for or interest in installing in-house wash bays. Of these, only four states—New Hampshire, North Dakota, Rhode Island and Utah—are not currently operating in-house wash bays. Colorado DOT reported the most expansive plan: A phased rollout over 10 years will install wash bays at all 254 Colorado DOT locations. Iowa DOT is also taking a comprehensive approach, planning to consolidate all washing activities into one or two bays in each garage. Other states install wash bays as new facilities are constructed, or plan to upgrade current sites to either equip them with wash bays or improve current washing facilities.

Structural and Technical Elements

The survey garnered relatively little information with regard to the structural or technical elements associated with a wash bay installation. A notable exception is California DOT's 2002 specification for a high-pressure wash bay and covered wash rack that describes mechanical and electrical systems, area and height standards, and materials and finishes (see [Appendix D](#)).

Other structural elements reported by respondents include the Sheetrock protection provided by aluminum or plastic sheets in Alaska's wash bays, and the 20-foot-high walkways constructed in Arizona's wash bays, at the front and on both sides. Maine DOT's wash bays also contain staging that provides access to higher areas of a truck, as well as waterproof curtains.

The size of water service lines into a wash bay ranged from the 3/4-inch water line used in Minnesota and West Virginia to the minimum 2-inch service lines installed in Iowa DOT wash bays. Other states reported a 1-inch minimum diameter for service lines (California) and 1 1/2- to 2-inch water lines (Virginia).

Agency Plans and Specifications

A literature search identified project letting documents, including specifications and plans, for a variety of truck wash facilities and system components:

- A request for proposals from the town of Simsbury, Connecticut, describes the design and construction of a drive-through truck wash using new components and existing ones from a previously used bus wash.
- A bid proposal and construction plans associated with an automatic truck wash in Delaware provide details of the system mentioned by the Delaware DOT survey respondent.
- An Idaho Transportation Department bid request outlines a scope of work for two pressure-washer wash bay systems.
- A new self-service wash bay and building housing a truck wash are addressed in Missouri DOT plans and bidding documents.
- An automatic fixed-arch drive-through wash system is described in a New Jersey DOT scope of work. A more limited New Jersey DOT scope of work describes a wash bay renovation and consolidation of oil/water separators.
- A recent New York State Thruway Authority proposal describes a project to install a wash system at two existing vehicle storage buildings.

Wastewater Management Practices

The survey presented respondents with a list of possible wastewater management practices in two categories—discharge, storage and disposal, and treatment and reuse—and asked which of these practices they employed.

Discharge, Storage and Disposal

Discharging wastewater to a sanitary sewer is the most commonly used wastewater disposal practice among respondents. All but two states reporting on their management of wastewater—Alaska and Arizona—do this. Other management practices are used much less widely, with the next most-used practice—on-site storage in a holding tank—reported by 38 percent of respondents. Almost two-thirds of respondents handle wash bay wastewater in more than one way.

Treatment and Reuse

Almost all respondents reporting on treatment practices use an oil/water separator to treat wastewater; oil and grease removal is done less frequently. Ten agencies use filtration systems, and only 10 agencies reuse wastewater, with more agencies reusing it for brine production than for truck washing. California and Colorado DOTs reuse wastewater for both purposes.

Guidance for Managing Wastewater

Almost all respondents rely on guidance from state and/or federal regulations or their agency's environmental best practices—often both—to manage wash bay wastewater. Only the Washington State DOT respondent indicated that agency wastewater management is not guided by either.

Other Guidance

Additional information about the management of wastewater appears in the Literature Search section of this synthesis. National guidance from a 2013 National Cooperative Highway Research Program (NCHRP) synthesis addresses the making of salt brine from recycled wash bay wastewater; a 2009

compendium of best practices published by the American Association of State Highway and Transportation Officials (AASHTO) considers most of the wash bay-related issues addressed in this synthesis report, including discharge and disposal of wastewater and recycling systems. Among the publications describing state practices and research are a 2014 Ohio DOT report that describes an extensive analysis of strategies to manage truck wash water at Ohio DOT maintenance facilities, and a 2008 report describing alternatives for preventing, controlling or treating runoff at New Jersey DOT truck washing facilities.

Wash Bay Costs

Wash bay installation costs varied significantly among the 12 respondents providing them, from a low of \$30,000 reported by West Virginia DOT to a high of over \$1 million for some California DOT wash bays. Comparing these costs is problematic given the limited information provided by respondents about their respective installations and regional cost differences. Only two agencies provided a specific dollar amount for annual operating costs—\$3,000 (Tennessee) and \$5,000 (Colorado). Several agencies noted that operating costs for wash bays are not separated from costs associated with the building housing the wash bay; other respondents noted that costs are dependent on the type of wash bay, the level of use and its location.

Off-Site Commercial Washing Facilities

Only six states described their use of off-site commercial washing facilities (Colorado, Indiana, Missouri, Ohio, Pennsylvania and Virginia), and few of these respondents provided much detail about their experiences.

The frequency of use ranged from as often as possible after storms (Indiana and Virginia) to monthly (Colorado) and finally, only when necessary (Pennsylvania). The Indiana respondent noted that drive time to and from commercial facilities has to be taken into account if there are impending storms. The per-truck cost to wash at commercial facilities ranged from \$12 to \$50 in Virginia and Pennsylvania, respectively.

Assessing Truck Washing Practices

Respondents rated the effectiveness of their agencies' truck washing practices in preventing or reducing corrosion on snowplow trucks using the rating scale of 1 = not at all effective to 5 = very effective. Their ratings:

- In-house washing with a wash bay = 3.96.
- Off-site commercial washing facilities = 3.83.
- In-house washing without a wash bay = 3.

While the use of off-site commercial washing facilities was rated almost as highly as the use of in-house wash bays, it is important to note that very few respondents reported using commercial facilities, and their use appears to be fairly limited even by the agencies using them. Significantly more respondents wash trucks in-house, with or without a wash bay.

Truck Washing Successes

In-House Wash Bays

Consistent with their effectiveness ratings, most respondents reported some degree of success with washing trucks in-house using a wash bay. Respondents cited a wide array of benefits, including controlling corrosion and costs, effective cleaning, improved safety, and convenience. They varied in their assessment of which aspects of a wash bay operation offer the greatest benefit.

In-House Washing Without a Wash Bay

Also consistent with their ratings, respondents highlighted fewer—and less resounding—successes with washing trucks without a wash bay. Only three respondents feel the benefits of washing a truck without a wash bay are the same as for washing a truck inside a bay. Others commented on the limitations of this washing practice in cleaning all parts of the truck.

Off-Site Commercial Washing Facilities

The few respondents who use commercial washing facilities find them to be effective. One respondent reported better luck with commercial facilities than with in-house washing without a wash bay, and another appreciated not having to deal with disposal of wastewater.

Truck Washing Challenges

In-House Wash Bays

Respondents' challenges with using a wash bay are most often associated with the configuration of the bay and the after-effects of washing. Among respondents' concerns are too few bays, limited staff engagement, wash bay size, inputs, ventilation and equipment (hoists), regulations, and wastewater treatment capacity.

In-House Washing Without a Wash Bay

Concerns associated with washing trucks in-house without a bay included high costs, environmental concerns, garage conditions, limited staff engagement (also cited in connection with use of an in-house wash bay), limited effectiveness, and weather conditions.

Off-Site Commercial Washing Facilities

The most common challenge associated with the use of commercial washing facilities is the travel time to and from the facility and wait time once at the facility; costs can also be a challenge.

Conclusion

The survey results pointed to a range of effective practices for snowplow truck washing rather than a single one-size-fits-all solution. While in-house wash bays are used by most survey respondents, many agencies also wash trucks without a wash bay (only eight respondents use in-house wash bays exclusively). We found relatively little commonality in respondents' descriptions of the equipment and inputs used in their wash bays or their washing practices. This could be due in part to the varying level of detail provided by respondents, and survey results may not be a true indicator of significant variability in practices. The survey did find consensus with regard to a broad description of the typical respondent wash bay—permanent, lighted, nonautomated and indoor.

While not offering a conclusive compilation of best practices, survey results provide a window into how agencies are dealing with the demands of truck washing—what current operations look like, what is

working, what is not working as well as it could, and what agencies plan to do in the future. In addition to providing a sampling of wash bay vendor options, and national and state guidance on wastewater management, the literature search identified plans and bidding documents that describe how a few manual and automated truck washing facilities will be renovated and constructed, which could help other agencies considering similar projects.

1 Introduction

Snowplow trucks take a beating during the winter maintenance season. Salt is a critical component of many winter maintenance operations, but it can have an extremely detrimental effect on the snowplow trucks used to apply it. Transportation agencies are looking for cost-effective, environmentally sensitive practices that produce clear results in reducing or preventing corrosion on snowplow trucks and prolong the life of winter maintenance equipment.

Use of an in-house wash bay is one of the ways transportation agencies fight the effects of salt and winter weather on winter maintenance equipment. This synthesis sought to identify best practices for the use of in-house wash bays and other truck washing alternatives such as off-site commercial washing facilities. A national survey of state department of transportation (DOT) winter maintenance experts gathered information about wash bay use, installation requirements and costs, treatment of wash bay wastewater, and the effectiveness of truck washing alternatives in reducing or preventing corrosion on snowplow trucks. The results of a literature search supplemented the survey findings.

2 Survey of Practice

2.1 Overview

An online survey distributed to the primary winter maintenance contacts in all 50 state DOTs gathered information about agency practices for the routine washing of snowplow trucks, with a particular interest in the use of in-house wash bays. Thirty-three states provided complete responses to the survey, with two states providing multiple responses:

- Alaska
- Arizona
- California
- Colorado
- Connecticut
- Delaware
- Idaho (three responses)
- Illinois (three responses)
- Indiana
- Iowa
- Kansas
- Kentucky
- Maine
- Massachusetts
- Michigan
- Minnesota
- Missouri
- Nebraska
- New Hampshire
- New Jersey
- North Dakota
- Ohio
- Oregon
- Pennsylvania
- Rhode Island
- Tennessee
- Utah
- Vermont
- Virginia
- Washington
- West Virginia
- Wisconsin
- Wyoming

Multiple Idaho and Illinois respondents provided information for their respective districts or regions. Several other respondents also noted that their responses were specific to one district or region.

The survey questions appear in [Appendix A](#); the full text of survey responses appears in [Appendix B](#).

Note: Some respondents were selective in how they responded to questions that gathered detailed information about their use of wash bays and other washing practices. The summary of survey results that follows is based on the responses provided and does not identify the states electing not to respond to specific questions.

2.2 Truck Washing Practices

The survey asked respondents to indicate which of three truck washing practices they use: an in-house wash bay, off-site commercial washing facilities, and in-house washing without a wash bay.

All 33 states do at least some washing in-house, and many respondents use more than one practice. Almost three-quarters of respondents use in-house wash bays. Slightly more—a full three-quarters of respondents—wash trucks in-house without a wash bay. Only eight respondents reported the exclusive use of in-house wash bays, and 10 exclusively wash trucks in-house without a bay.

Only six states reported using commercial washing facilities, and no state uses commercial facilities exclusively; all six also do some in-house washing as well. Table 2.1 presents respondents’ truck washing practices.

Table 2.1 Truck Washing Practices

State	Truck Washing Practice		
	In-House Wash Bay	Off-Site Commercial Washing Facility	In-House Washing Without a Wash Bay
Alaska	X		X
Arizona	X		
California	X		
Colorado	X	X	X
Connecticut	X		X
Delaware	X		X
Idaho 1	X		X
Idaho 2			X
Idaho 3			X
Illinois 1	X		
Illinois 2			X
Illinois 3	X		
Indiana	X	X	X
Iowa	X		X
Kansas	X		
Kentucky			X
Maine	X		X
Massachusetts	X		X
Michigan	X		X
Minnesota	X		X
Missouri	X	X	X

State	Truck Washing Practice		
	In-House Wash Bay	Off-Site Commercial Washing Facility	In-House Washing Without a Wash Bay
Nebraska	X		X
New Hampshire			X
New Jersey	X		
North Dakota			X
Ohio	X	X	X
Oregon	X		X
Pennsylvania	X	X	X
Rhode Island			X
Tennessee	X		
Utah			X
Vermont			X
Virginia	X	X	X
Washington	X		X
West Virginia	X		
Wisconsin			X
Wyoming	X		
Total Number of Respondents	27	6	28

2.3 Wash Bay Description

Number of Wash Bays

The number of wash bays maintained by each responding state varies widely, from four in Delaware to 200 in California. Two-thirds of respondents reported 50 or fewer wash bays. Comparing the number of wash bays state-to-state is challenging given the number of respondents providing district- or region-level data, and the variability in the roadway networks, populations and climates of the responding states. Table 2.2 summarizes the survey responses.

Table 2.2 Number of Wash Bays

Number of Wash Bays	Number of Respondents	State/Details
0 to 15	8	<i>Delaware: 4. Washington: 8 to 10.</i>

Number of Wash Bays	Number of Respondents	State/Details
		<p><i>Maine:</i> Approximately 10.</p> <p><i>West Virginia:</i> 10 in respondent’s area of the state.</p> <p><i>Illinois 3:</i> 11.</p> <p><i>Nebraska:</i> Approximately 12.</p> <p><i>Idaho 1:</i> Four exterior wash pads; eight indoor locations not designated only for washing.</p> <p><i>Missouri:</i> 13 of 24 maintenance buildings have a wash bay (specified area covers 18 of state’s 114 counties).</p>
16 to 50	9	<p><i>Wyoming:</i> 18.</p> <p><i>Minnesota:</i> 20.</p> <p><i>Alaska:</i> 20 to 25.</p> <p><i>Arizona:</i> 24.</p> <p><i>Illinois 1 and Tennessee:</i> 26.</p> <p><i>New Jersey and Oregon:</i> 40.</p> <p><i>Indiana:</i> Approximately 50.</p>
51 to 100	4	<p><i>Pennsylvania:</i> Approximately 55.</p> <p><i>Connecticut:</i> 63 (built into facilities).</p> <p><i>Colorado:</i> 65.</p> <p><i>Ohio:</i> 80+.</p>
101+	4	<p><i>Kansas:</i> 110 +/-.</p> <p><i>Virginia:</i> Approximately 150.</p> <p><i>Iowa:</i> Over 150.</p> <p><i>California:</i> 200.</p>

Wash Bay Features

The survey asked respondents to describe their wash bays by selecting from a list of possible features. The typical wash bay described by respondents is a permanent, lighted, nonautomated, indoor wash bay, almost equally likely to be new construction or a retrofit of an existing space.

The eight respondents reporting use of pull-on/pull-through wash bays were not prompted to describe the automated elements of these facilities; however, responses to open-ended survey questions identified three states that maintain or are constructing at least one fully automated wash bay—Alaska, Delaware and New Jersey. (See pages 31 and 32 of this synthesis report for more information about the automatic wash systems used in Delaware and New Jersey, respectively.)

Table 2.3 presents the features of respondents’ wash bays. Two responses are not represented in the table:

- Indiana is the only state to report the use of a portable wash bay.
- Massachusetts uses wash bays only for rinsing vehicles, not washing.

Table 2.3 Wash Bay Features

State	Wash Bay Feature							
	Indoor	Outdoor	New construction	Retrofit of existing space	Permanent wash bay	Nonautomated wash bay	Pull-on/pull-through wash bay	Lighted wash bay
Alaska	X	X	X	X	X	X	X	X
Arizona	X		X	X	X			X
California	X		X	X	X	X		X
Colorado	X	X	X	X	X	X		X
Connecticut	X			X	X	X		X
Delaware	X				X			X
Idaho 1	X	X	X					
Illinois 1	X			X	X	X		X
Illinois 3	X			X	X			X
Indiana	X		X	X	X	X	X	X
Iowa	X	X	X	X	X	X	X	X
Kansas	X		X		X	X		X
Maine	X	X	X	X	X	X		X
Michigan	X		X	X	X	X	X	X
Minnesota	X		X	X	X	X		X
Missouri	X	X	X	X	X	X		X
Nebraska	X		X		X	X	X	
New Jersey	X	X	X	X	X	X		
Ohio	X		X	X	X	X	X	X
Oregon	X	X			X	X		
Pennsylvania	X	X	X	X	X	X	X	X
Tennessee	X				X	X	X	X
Virginia	X	X	X	X	X	X		X
Washington	X	X	X	X	X	X		X
West Virginia	X	X	X	X	X			X
Wyoming	X		X					
Total Number of Respondents	26	12	20	19	24	20	8	21

Wash Bay Equipment and Inputs

Some respondents described the equipment and other types of inputs (water, soap) used in their wash bays. Most of these responses highlighted the use of a power or pressure washer. Table 2.4 summarizes these responses.

Table 2.4 Wash Bay Equipment and Inputs

State	Wash Bay Equipment and Inputs							
	Power/pressure washer	Handheld wand	Underbody wash	Heated water	Commercial soap and water	Steam generator	Portable steam cleaner	Chemical treatment*
Alaska	X							
Delaware			X					
Idaho 1	X							
Illinois 1	X	X		X				
Illinois 2	X							
Illinois 3	X	X	X	X				
Indiana	X		X**	X				
Iowa	X							X
Kansas	X			X				
Minnesota	X	X		X				
Missouri					X		X	
Pennsylvania	X		X			X		
Tennessee	X		X			X		X
Vermont								X
Virginia	X					X		X
West Virginia	X	X		X				
Wyoming	X							
Total Number of Respondents	14	4	5	6	1	3	1	4

* See page 28 of this synthesis report for more information about respondents' use of chemical treatments.

** Permanent or portable underbody wash.

2.4 Wash Bay Use

Time of Day

Slightly more than 80 percent of respondents use their wash bays during both daytime and nighttime hours. Four states—Kansas, Massachusetts, Nebraska and Wyoming—use wash bays only during the day. Only Maine DOT reported using wash bays exclusively during nighttime hours.

Washing Frequency

More than half of respondents wash trucks after each event during winter operations. Only four respondents wash trucks daily or after every shift. Many respondents noted that a washing schedule can be disrupted by frequent winter events. Table 2.5 summarizes the responses.

Table 2.5 Washing Frequency

Washing Frequency	State
Daily	Idaho 1, Illinois 1, West Virginia (as needed; could be twice a day)
After every shift	Michigan (if possible)
After each event	Arizona, Connecticut, Delaware, Illinois 3, Indiana, Iowa, Kansas, Maine, Minnesota, Missouri, Nebraska, New Jersey, Ohio, Tennessee, Virginia
Weekly	Idaho 1, Pennsylvania, Washington
Monthly	Colorado, Wyoming
Varies	California, Oregon
Periodically after winter maintenance season	Minnesota, Missouri, Nebraska, Pennsylvania, Tennessee

Wash Cycle Length

When asked about the time it takes to complete a wash cycle, relatively few respondents provided a specific time period. Only two respondents reported cycle times for automatic wash bays: a one- to two-minute wash cycle in Alaska; in Delaware, a five-minute cycle time. Time frames for manual washing ranged from 15 minutes in Pennsylvania to up to one hour in Connecticut. Other respondents noted that washing times vary, sometimes depending on truck size. Table 2.6 summarizes the responses.

Table 2.6 Wash Cycle Length (Manual Wash Bays)

Wash Cycle Length (Manual Wash Bays)	State/Details
Less than 30 minutes	<i>Pennsylvania:</i> 15 minutes. <i>Illinois 3:</i> 15 to 30 minutes. <i>Idaho 1:</i> 20 to 30 minutes.
30 minutes	<i>Nebraska:</i> 30 minutes (varies). <i>Tennessee:</i> 30 minutes (minimum).

Wash Cycle Length (Manual Wash Bays)	State/Details
30 minutes to 1 hour	<i>Minnesota:</i> 30 minutes to 1 hour. <i>Wyoming:</i> 40 minutes (average). <i>Connecticut:</i> 45 minutes to 1 hour.
Varies	Alaska, Illinois 1, Indiana, Missouri, Ohio, West Virginia

Washing Practices

Several respondents provided details about their wash bay washing practices:

Commercial Chemical Treatments

Several states reported the use of chemical treatments when washing trucks. A washing “agent” is used in Vermont to encourage the elimination of corrosion, and Virginia DOT uses an unnamed salt neutralizer in its pressure washers. Two respondents provided more information about the products they use:

- Many of Iowa DOT’s garages have seen “very good results” from use of Salt-Away as a post-wash to remove as much salt as possible from the truck. This commercial product is designed to inhibit rusting and corrosion on all salt-exposed surfaces.
- In Tennessee, all vehicles are rinsed and then washed from the top down, including the undercarriage, using Neutro-Wash, a product that neutralizes and removes salt residue. All chains and gears on Tennessee DOT’s v-box spreaders are treated with Lubra-Seal at the end of each winter season. Lubra-Seal is a proprietary blend of sealants and lubricants designed to protect equipment from corrosion during summer storage.

See page 28 of this synthesis report for more information about the products identified above.

Safety Rinses

Ohio and West Virginia DOTs perform safety rinses during a storm. In Ohio, this involves cleaning the windows, mirrors and lights. The West Virginia DOT respondent noted that perhaps the most important element of truck washing during a storm event is keeping the windows and mirrors clean so drivers can safely operate the equipment.

Examples of Washing Practices

Some respondents provided a detailed description of a typical truck wash:

- **Automated wash bays:**
 - Alaska’s automated wash bay requires the plow driver to drive the truck very slowly through the bay for a one- to two-minute wash cycle. Washing begins with a spray of high-pressure water, followed by an application of soap and high-pressure water to remove it, and a final rinse.
 - Delaware’s five-minute automated wash bay applies soap to the underbody, sides and top of the truck using high-pressure arches; a rinse arch removes the soap. All water used in the bay is fresh water.
- **Documented practices.** Tennessee DOT has documented standard operating procedures for cleaning a variety of truck types; see [Appendix E](#).

- **Other examples of washing practices:**
 - In Kansas, state regulations prohibit the washing of trucks without a wash bay. A manual truck wash begins with the truck backing into the wash bay. A hoist assembly is used to lift the truck's hopper, and the hopper and bed of the truck are washed with a high-pressure, hot-water wash. After the rest of the truck is washed, the hopper is put back in the truck and the truck is pulled out of the bay.
 - Most bays in Minnesota are set up with a pressure washer. Hot water is optional and soap can be applied through the pressure wand. Hand washing with a bucket is still performed if needed.
 - The majority of Pennsylvania DOT's wash bays are located in urbanized areas with sewer and public water connections. Most bays are simple setups that provide an enclosed pressure washer with a steam generator, which lessens the need for large volumes of water.
- **Varied washing sites.** One of the Idaho respondents reported different types of wash bays in a single region, with some using high-volume hoses and pressure washers, while others use only high-volume hoses. Still other locations use a high-volume hose to rinse a truck outside a garage bay, bringing the truck inside for a final wash.

2.5 Wash Bay Installation

Sixteen states reported plans for or interest in installing in-house wash bays. Of these, only four states—New Hampshire, North Dakota, Rhode Island and Utah—are not currently operating in-house wash bays. For the remaining 12 respondents, plans are to install additional wash bays, not the first one.

Colorado DOT reported the most expansive plan: A phased rollout over 10 years will install wash bays at all 254 Colorado DOT locations. Iowa DOT is also taking a comprehensive approach, planning to consolidate all washing activities (including in-house washing currently done without a wash bay) into one or two bays in each garage.

A few respondents provided descriptions of planned facilities. In Idaho, a building in the planning phase will allow for drive-through manual washing of vehicles, which the agency hopes will encourage safer and more frequent washing. The new building is expected to include an elevated platform with a pressure washer and high-volume hoses. A commercial-type automatic truck wash system that is planned in Delaware will use fresh water and discharge wastewater to the local sanitary sewer system. (See page 31 of this synthesis report for bidding documents related to Delaware DOT's automatic truck wash.)

Wash bays are installed as new facilities are constructed in Indiana, Kansas, Maine, Nebraska and Virginia. In Kansas, wash bays are most often found in new stand-alone buildings, though the agency is starting to incorporate wash bays in subarea buildings where a wash bay is not present.

Several states plan to upgrade current sites:

- Facilities upgrades at Connecticut DOT include equipping the sites with wash bays.
- One of the Illinois respondents noted that older wash bays are being retrofitted with oil/water separators. The successful application of an undercarriage wash is prompting interest for its use at other Illinois sites.

- Indiana DOT adds wash bays to existing facilities as funding permits.
- Missouri DOT maintains a limited number of outdoor concrete pads that are used for washing trucks. The pads are equipped with oil/water separators and connected to the city sewer system. The agency's long-range plan is to enclose these sites.

Structural and Technical Elements

The survey garnered relatively little information with regard to the structural or technical elements associated with a wash bay installation. A notable exception is California DOT's 2002 specification for a high-pressure wash bay and covered wash rack. These specifications, included as [Appendix D](#), describe mechanical and electrical systems, area and height standards, and materials and finishes.

Some respondents described in general terms some of the technical elements of their wash bay operations:

- Tennessee DOT wash bays are built with a concrete pad and center drain, and include an oil/water separator, cold water line, Steam Jenny power washer and portable heat.
- In Virginia, new wash bays are equipped with lighting, heat, garage doors, drains, a grit chamber, an oil/water separator and a steam/pressure washer. Pressure is set at the washer, and water is delivered through a 1 1/2- or 2-inch line.
- In West Virginia, the building housing a wash bay must be large enough to fit the equipment being washed with extra room to allow for the hand-washing of vehicles, ideally with a ceiling high enough to raise truck beds for cleaning. The agency uses motorized pressure washers, which means line pressure is not an issue as long as there is a constant supply of water from a water line at least 3/4 inch in diameter. All discharges run through a grit trap and an oil/water separator.

Other structural elements reported by respondents include the Sheetrock protection provided by aluminum or plastic sheets in Alaska's wash bays, and the 20-foot-high walkways constructed in Arizona's wash bays at the front and on both sides. Maine DOT's wash bays also contain staging that provides access to higher areas of a truck, as well as waterproof curtains.

The size of water service lines into a wash bay ranged from the 3/4-inch water line used in Minnesota and West Virginia to the minimum 2-inch service lines installed in Iowa DOT wash bays. Other states reported a 1-inch minimum diameter for service lines (California) and 1 1/2- to 2-inch water lines (Virginia).

2.6 Wastewater Management Practices

Handling wastewater generated by wash bays can be challenging for transportation agencies that are seeking to comply with state and federal environmental regulations and also need a cost-effective approach to disposal. The survey asked respondents to identify the practices used to manage the wastewater generated by their wash bay operations by selecting all relevant practices from a list of wastewater management practices in two categories:

- Discharge, storage and disposal.
- Treatment and reuse.

Discharge, Storage and Disposal

Discharging wastewater to a sanitary sewer is the most commonly used wastewater disposal practice among respondents. All but two states reporting on their management of wastewater—Alaska and Arizona—do this. Other management practices are used much less widely, with the next most-used practice—on-site storage in a holding tank—reported by 38 percent of respondents. Almost two-thirds of respondents handle wash bay wastewater in more than one way. Table 2.7 describes respondents’ practices for discharging, storing or disposing of wash bay wastewater.

Table 2.7 Wastewater Management Practices: Discharge, Storage and Disposal

State	Wastewater Management Practice					
	Discharge to leach field	Discharge to retention pond	Discharge to sanitary sewer	Discharge to storm sewer	Off-site disposal	On-site storage in holding tank
Alaska		X		X		X
Arizona				X		
California			X			
Colorado	X		X			
Connecticut			X			X
Delaware			X	X		
Idaho 1	X	X	X			X
Illinois 1			X			
Illinois 3	X		X			
Indiana			X			X
Iowa			X			
Kansas			X			
Maine			X		X	X
Massachusetts			X		X	X
Michigan			X			
Minnesota	X	X	X			X
Missouri		X	X			
Nebraska			X			
New Jersey			X			
Ohio		X	X		X	X
Oregon		X	X	X		X
Pennsylvania			X		X	
Virginia		X	X			X

State	Wastewater Management Practice					
	Discharge to leach field	Discharge to retention pond	Discharge to sanitary sewer	Discharge to storm sewer	Off-site disposal	On-site storage in holding tank
Washington		X	X	X		
West Virginia			X			
Wyoming	X		X			
Total Number of Respondents	5	8	24	5	4	10

Treatment and Reuse

Deciding how to dispose of wastewater generated by the wash bay is only one element of most agencies' wastewater management practices. Many agencies treat wastewater before disposing of it or holding it on-site for later removal, and some reuse wastewater rather than dispose of it.

Almost all respondents reporting on treatment practices use an oil/water separator to treat wastewater; oil and grease removal is done by fewer agencies. Only 10 agencies reuse wastewater, with more agencies reusing it for brine production than for truck washing. California and Colorado DOTs reuse wastewater for both purposes.

In Colorado, some wash bay wastewater is filtered for heavy metals and chlorides before reuse; one bay converts wash water to brine. In Ohio, some wash bays discharge wastewater into an area that filters the water or lets it settle before using it to make brine. Reuse for brine production proved challenging for Maine DOT, with the respondent noting that the practice was not cost-effective and the effluent had an unpleasant odor.

Table 2.8 identifies the treatments agencies employ before disposing of or reusing wastewater, and the ways wastewater is reused.

Table 2.8 Wastewater Management Practices: Treatment and Reuse

State	Wastewater Management Practice					
	Evaporator system	Filtration	Oil and grease removal	Oil/water separator	Reuse for brine production	Reuse for truck washing
Alaska		X		X		X
California	X	X	X	X	X	X
Colorado		X			X	X

State	Wastewater Management Practice					
	Evaporator system	Filtration	Oil and grease removal	Oil/water separator	Reuse for brine production	Reuse for truck washing
Connecticut				X		
Delaware				X		
Idaho 1			X	X		
Illinois 1						
Illinois 3				X		
Indiana				X	X	
Iowa			X	X	X	
Kansas			X			
Maine				X	X	
Massachusetts			X	X		
Michigan		X				
Minnesota		X				
Missouri				X		
Nebraska				X		
New Jersey		X		X		
Ohio	X	X		X	X	
Oregon	X	X	X	X		X
Pennsylvania		X	X	X		X
Tennessee				X		
Virginia	X		X	X	X	
Washington	X			X		
West Virginia		X		X		
Total Number of Respondents	5	10	8	20	7	5

More About Wastewater Management Practices

Some respondents offered additional details about their wastewater management practices:

- Evaporator systems.** Oregon DOT’s evaporator system includes evaporation from a detention pond. Similarly, in Washington, the evaporator system is a lined pond that receives the discharge from wash bays and evaporates over time. The respondent noted that this practice is used in an extremely arid part of Washington that receives only 6 inches of precipitation annually.

- **Grit removal.** Delaware, Kansas, Virginia and West Virginia DOTs use a grit removal chamber or grit trap, a treatment practice not included in the survey’s list of possible management practices (Delaware uses a Stormceptor, an oil/grit separator system).
- **Obtaining approvals.** If a wash bay is attached to a municipal sewage system, Idaho Transportation Department outlines its best management practices (BMPs) for pretreating the wastewater and receives a “will serve” letter from the receiving municipality before construction and/or connection to the sewage system. Ohio DOT seeks approval from the U.S. Environmental Protection Agency before initiating any wastewater reuse process.
- **Testing.** One of the Idaho respondents reported the requirement to retain all wastewater on site, in evaporative ponds or other containments, to be tested and disposed of if the wash bay is not attached to a municipal sewer system. In Ohio, wastewater that is to be reused is first tested after being run through an oil/water separator. In West Virginia, wastewater that cannot be discharged to a sanitary sewer is run through an oil/water separator, and then through a sand filter. This type of discharge is tested for contaminants twice a year.

2.7 Guidance for Wastewater Management

Almost all respondents rely on guidance from state and/or federal regulations or their agency’s environmental best practices—often both—to manage wash bay wastewater. Only the Washington State DOT respondent indicated that agency wastewater management is not guided by either.

Some agencies reported on specific regulatory guidance:

- New Jersey DOT is subject to New Jersey Department of Environmental Protection guidelines. At minimum, filtration is used at any possible point of discharge to stormwater systems.
- In Pennsylvania, all wash bays discharge wastewater to the local sanitary sewer system or water is recycled. The agency recently discovered through testing required under National Pollutant Discharge Elimination System permitting and Pennsylvania Clean Streams regulations that several bays were not connected to a sewer. These bays are being retrofitted or connected to sanitary sewer systems.
- The West Virginia Department of Environmental Protection issues permits for all wash water discharges.
- In Wyoming, results of self-testing are reported to the Wyoming Department of Environmental Quality Solid Waste Division in connection with potential hazardous material levels in the agency’s sumps.

Other agencies highlighted environmental best practices:

- Arizona DOT’s best practices manual for vehicle and equipment washing appears in [Appendix C](#).
- California DOT’s internal policy:

Vehicle and equipment washing is allowed only at designated rinsing areas, wash racks or other designated areas. All engine compartment and undercarriage rinsing/washing must be performed within a wash rack facility. The district maintenance stormwater coordinator will approve or provide input on the proper location for a designated rinsing area.
- Minnesota DOT tries to minimize contamination by using wash water sparingly.

- Previously, a general permit from Oregon’s Department of Environmental Quality may have been required for wash bay discharges that did not go to a sanitary sewer. These permits have expired, and it is not clear when permits will be reinstated. Oregon DOT has developed and implemented BMPs that match the expected updates to state regulations.

2.8 Wash Bay Costs

Installation Costs

Only 12 respondents provided a specific cost or range of costs for installing a wash bay. Two other respondents provided information about costing methods. Wash bay installation costs varied significantly among these few respondents, from a low of \$30,000 reported by West Virginia DOT to a high in the millions of dollars for some California DOT wash bays. Comparing these costs is problematic given the limited information provided by respondents about their respective installations and regional cost differences. Table 2.9 summarizes the costs reported by respondents. A rough average of these costs is \$450,000.

Table 2.9 Installation Costs

Wash Bay Installation Cost	State	Comment/Facility Description
\$30,000	West Virginia	N/A
\$40,000	Tennessee	N/A
\$100,000	Colorado	Average cost.
\$150,000	Oregon	Cost for most recent project; lower cost for uncovered bay or retrofit.
\$200,000 to \$300,000	Kansas	N/A
\$300,000	Delaware	Fully automated wash system and structure.
\$350,000	Idaho 1	For a current project.
\$350,000 to \$400,000	Iowa	Drive-through reclamation building/wash bay.
\$450,000 (approximate)	Washington	For a stand-alone, large building located on a mountain pass with a lot of temperature/snow load issues that drove up the cost substantially.
\$500,000	Arizona	New construction.
\$500,000 to \$1 million	Pennsylvania	New concrete enclosure with a conventional roof, Steam Jenny pressure washer and undercarriage wash.
\$2.1 million	California	Average of seven projects that ranged from \$500,000 for a simple pad and canopy in Los Angeles to just under \$6 million for a new enclosed wash rack in snow country.

Wash Bay Installation Cost	State	Comment/Facility Description
Costing methods	Maine	\$6,000 to \$8,000 is added to the cost of construction of a standard (nonwash) bay.
	Nebraska	Uses a cost of \$150 per square foot for planning purposes.

Operating Costs

Only two agencies provided a specific dollar amount—\$3,000 (Tennessee) and \$5,000 (Colorado) for annual operating costs. Several agencies noted that operating costs for wash bays, including costs for power, water and effluent disposal, are not separated from costs associated with the building in which the wash bay is housed. Other agencies noted that operating costs are dependent on the type of wash bay, the level of use and its location, but offered no specific costs.

2.9 Off-Site Commercial Washing Facilities

Only six states described their use of commercial washing facilities (Colorado, Indiana, Missouri, Ohio, Pennsylvania and Virginia), and few of these respondents provided much detail about their experiences.

Pennsylvania and Colorado DOTs use conventional truck wash facilities; Indiana and Virginia DOTs use truck washes at truck stops. The frequency of use ranged from as often as possible after storms (Indiana and Virginia) to monthly (Colorado) and finally, only when necessary (Pennsylvania). The Indiana respondent noted that drive time to and from commercial facilities has to be taken into account if there are impending storms.

The cost of washing a truck at a commercial facility ranges from \$12 to \$50 in Virginia and Pennsylvania, respectively. In Virginia, commercial washes are purchased through local contracts so prices vary (typically from \$12 to \$30 per truck). The Colorado respondent reported a flat per-truck cost of \$25.

2.10 Assessing Truck Washing Practices

The survey asked respondents to rate the effectiveness of each of the three truck washing practices addressed in the survey, and then asked for specific details about what worked well and what proved challenging for each washing practice.

Rating the Effectiveness of Truck Washing Practices

The survey asked respondents to rate the effectiveness of their agencies' truck washing practices in preventing or reducing corrosion on snowplow trucks using the rating scale of 1 = not at all effective to 5 = very effective.

Respondents rated in-house washing with a wash bay as most effective among the three washing alternatives. While respondents rated the use of off-site commercial washing facilities almost as highly as washing in-house with a wash bay, it is important to note that very few respondents reported the use of commercial washing facilities, and their use appears to be fairly limited even by the agencies using them. Significantly more respondents wash trucks in-house, with or without a wash bay.

Respondents' ratings:

- In-house washing with a wash bay = 3.96.
- Off-site commercial washing facilities = 3.83.
- In-house washing without a wash bay = 3.

Truck Washing Successes

In-House Wash Bays

Consistent with their effectiveness ratings, most respondents reported some degree of success with washing trucks in-house using a wash bay. Respondents cited a wide array of benefits, including controlling corrosion and costs, effective cleaning, improved safety, and convenience. They varied in their assessment of which aspects of a wash bay operation offer the greatest benefit. Benefits mentioned by respondents include:

- **Controls corrosion.** High-volume water hose connections do a good job of controlling corrosion in Idaho. Salt-Away has produced “very good results” for Iowa DOT as an additional salt remover and corrosion preventative, and in-house washing reduces corrosion from salt on Pennsylvania DOT’s wiring and hydraulic systems. In Virginia, the use of salt neutralizer in pressure washers is “a big plus.”
- **Controls costs.** Maintaining a fleet of clean vehicles increases the average life span and increases the value at resale at Pennsylvania DOT’s end-of-life auctions.
- **Cleans effectively.** Connecticut, Iowa and Kansas DOT respondents noted that in-house wash bays clean equipment more thoroughly than other washing practices. In New Jersey, the climate-controlled environment of a wash bay allows for a more thoroughly washed vehicle.
- **Improves safety.** Minnesota and West Virginia DOT respondents noted that wash bays provide an easy way to clean windows and mirrors, and in Kansas, wash bays provide a safer place to clean trucks.
- **Provides convenience.** In Alaska, the more convenient a wash bay is, the more it gets used. The Missouri DOT respondent noted that wash bays are “very handy and employees are much more likely to use them,” and in Nebraska, wash bays allow for year round cleaning of equipment.
- **Satisfies inspection requirements.** In Pennsylvania, in-house wash bays are needed to satisfy state inspection of truck frame rails.

Some respondents offered best practices for the installation and use of wash bays:

- Use only fresh water, select the right soaps and identify the appropriate dwell time for automated washing (Delaware).
- Standardize wash bay components to help speed wash time (Minnesota).
- Develop standard operating procedures for cleaning the agency’s fleet of snow removal equipment. These procedures, coupled with spot inspections, helped to increase awareness and achieve statewide compliance (Tennessee).
- Ensure manual control of washer pressure to properly clean different types of equipment (Virginia).

- Obtain local buy-in. A wash bay installed without the local superintendent’s buy-in was little used until external pressure was applied (Washington).

In-House Washing Without a Wash Bay

Also consistent with their ratings, respondents highlighted fewer—and less resounding—successes when washing trucks without a wash bay. Respondents from only three states—Minnesota, Pennsylvania and Virginia—feel the benefits of washing a truck without a wash bay are the same as when washing a truck inside a bay.

Washing without a wash bay is effective in maintaining acceptable chloride levels in accordance with Kentucky Transportation Cabinet’s Stormwater Management Plan. One Idaho Transportation Department region has found that it is easier to clean built-up material from the exterior pads than from the front of garage bays or interior floors or drains, and crews are more likely to wash the trucks using the exterior pads.

Other respondents offered much more muted praise for the practice of washing without a bay, highlighting its limited effectiveness. The California DOT respondent noted that this type of wash is “basically just a rinse, and not useful for anything larger than a pickup.” The Connecticut DOT respondent identified limited value in this washing practice because truck bodies cannot be fully raised, and water pressure is reduced from hoses used outside a bay. The Rhode Island DOT respondent noted that while washing outside a bay can keep the outside of a truck clean, the practice is not effective in keeping the engine bay and undercarriage clean.

Off-Site Commercial Washing Facilities

Commercial washing facilities “perform well” for Ohio DOT, and the Pennsylvania respondent noted that, like in-house wash bays, use of a commercial washing facility will reduce corrosion on wiring and hydraulic systems. Indiana DOT has had better luck with commercial facilities than with in-house washing without a wash bay, and in Virginia, not having to deal with disposal of wastewater is a “big plus” of commercial facilities.

Truck Washing Challenges

In-House Wash Bays

Survey respondents listed a range of challenges with using in-house wash bays. Most concerns center around the configuration of the wash bay and the after-effects of washing. Among the challenges cited:

- **Cleaning the wash bay.** In Alaska, keeping the drains and walls clean, and pumping and cleaning holding tanks, are labor-intensive. Cleaning drains, catch basins and grit traps is a challenge in Idaho, Nebraska and West Virginia.
- **Equipment.** With staff not trusting the hoist assembly in a wood truss roof, Kansas DOT is moving to self-supporting hoppers to eliminate the need for hoists in its wash bays.
- **Lack of time.** In California, equipment is typically washed at the end of a shift, and having enough time for everyone on the shift to wash can be difficult.
- **Limited access.** Respondents from Illinois and Nebraska reported too few wash bays to serve washing needs.

- **Limited staff engagement.** Respondents in Missouri, Tennessee, Washington and Wyoming cited the need to encourage staff to comply with statewide or local procedures or prioritize truck washing.
- **Regulations/treatment capacity.** Meeting environmental regulations or local sewer requirements is challenging in Delaware, New Jersey and Pennsylvania. Some smaller municipalities in Oregon are hesitant to accept water from uncovered bays given the treatment capacity of their systems.
- **Wash bay inputs.** Hose systems are a challenge in Connecticut. The water supply can be problematic in Indiana, and the Minnesota respondent cautions against excess water usage.
- **Wash bay size.** In Connecticut, the width of wash bays can be a challenge, and in Ohio, equipment is too large to allow staff to easily walk around the equipment as they are washing it.
- **Wash bay ventilation.** In Alaska, use of a diesel-powered pressure washer requires proper ventilation, and when the outside temperature gets below 20° F, the pressure washer creates a lot of steam, making it difficult to see.

In-House Washing Without a Wash Bay

Respondents offered the following when asked about the challenges of washing without a wash bay:

- **Environmental concerns.** Managing runoff during periods of heavy rainfall is challenging for many states.
- **Garage conditions.** Washing without a designated wash bay “makes a mess” of Ohio DOT’s garages and causes corrosion on structural members of North Dakota DOT’s maintenance buildings due to high humidity. Excess overspray, and salt, dirt and debris landing on other vehicles are a challenge in Minnesota.
- **Limited effectiveness.** Both the California and Rhode Island respondents noted that washing without the use of a wash bay was not effective in preventing corrosion. One of the Illinois respondents reported varying degrees of success with wash additives.
- **Limited staff engagement.** Several respondents noted that it is difficult to get crews to commit to washing vehicles in winter weather, especially after a long shift. In Vermont, getting staff to thoroughly wash vehicles using a chemical agent that reduces corrosion has been a challenge.
- **Weather conditions.** In Idaho and Missouri, freezing conditions during the winter present hazards at pad sites, and water hoses may freeze. Inclement weather also limits New Jersey DOT’s ability to get its trucks clean.

Off-Site Commercial Washing Facilities

The most common challenge associated with use of commercial washing facilities is the travel time to and from the facility and wait time once at the facility; costs can also be a challenge. The Missouri DOT respondent expressed concern about employees having to handle cash, and also noted that some facilities will not permit the agency to wash trucks given concerns about salt from winter operations and oil from summer operations. Virginia DOT prefers to add salt neutralizer and alter water pressure when washing its trucks, and these practices are not permitted when washing at a commercial facility.

3 Literature Search

3.1 Overview

A literature search supplemented survey findings in five topic areas:

- Commercial wash bay systems.
- Chemical treatments.
- Managing wastewater.
- State and municipal wash bay plans and specifications.
- Other guidance.

3.2 Commercial Wash Bay Systems for In-House Use

Portable Systems

While only one survey respondent—Indiana DOT—reported the use of a portable wash system, other states are using wash pads or wash racks that might be portable if the agency chooses to use them in that manner. Below is a sampling of the portable wash systems available commercially.

DOT Portable Wash Rack System: A Storm Water Pollution Prevention Plan (SWPPP) Compliant Wash Rack, Hydro Engineering Inc., 2016.

<https://www.hydroblaster.com/DOTWashRack.htm>

With this system, trucks are driven onto a portable wash rack that uses recycled water pressurized through the vendor's pressure-washing system. A heated, high-pressure wash is followed by a fresh-water rinse. All water and contaminants are collected and contained by the wash rack system. A wastewater treatment/recycling system purifies the water, allowing for its reuse in the washing system.

Related Resources:

Hydropad Wash Racks: Introduction, Hydro Engineering Inc., 2016.

<https://www.hydroblaster.com/3pics50KTrackhoe.htm>

This web page provides images and descriptions of the Hydropad portable wash rack system.

Instant Wash Rack Specifications; Municipal Storm Water Pollution Prevention Plan, Hydro Engineering Inc., undated.

<https://www.hydroblaster.com/SWPPSpec.htm>

The vendor provides this template specification that can be used by agencies wishing to use its portable wash rack system.

Portable Wash Bay Containment Pads, Wash Bay Solutions International, 2016.

<http://www.washbaysolutions.com/portable-wash-bay-containment-pads.php>

As this website indicates, “portable wash bay containment pads can provide an economical alternative to a concrete wash pad.” Standard features of this vendor's product include:

- Designed to be surface-mounted on concrete wash area—no excavation required.
- Built to any size and configuration.

- Fiberglass composite system consisting of a 1/4-inch steel plate core completely encapsulated in fiberglass.
- Drain port for fluid removal or connection to plumbing.
- Projected useful life of 15 to 20 years.

Automatic Truck Wash Systems

The vendors listed below are only a sampling of those offering automatic truck wash systems that might be appropriate for DOT use. See page 30 of this synthesis report for specifications issued by states and municipalities preparing to install automatic truck wash systems.

V-Max, Belanger Inc., 2016.

<http://www.belangerinc.com/v-max>

This touch-free automatic large vehicle wash system is available in three configurations and can wash “both a 30 foot dump truck or a 75 foot tractor trailer and everything in-between in as little as 3-6 minutes.”

Municipality Wash System, Hydro-Chem Systems Inc., 2016.

<http://hydrochemsystems.com/municipality-wash-system/>

Among this vendor’s offerings are a variety of specially designed undercarriage systems available to work with a municipal vehicle wash system.

Heavy Duty Vehicle Wash Systems, InterClean Equipment Inc, undated.

http://www.tammermatic.com/content/download/614/5149/file/InterClean_Brochure_EN.pdf

This vendor brochure indicates that it “takes just 60 to 90 seconds for our units to clean a garbage truck, and the wash is unattended.”

Truck Wash, Pseco Inc., 2016.

<http://www.psecoinc.com/automatic-truck-wash-system/wash.html>

Among the options offered by this vendor’s automatic truck wash system are a spinner rinse arch, oscillating blast arch and foaming detergent arches.

Automatic Truck Wash Systems, Westmatic Corporation, 2016.

<http://www.westmatic.com/automatic-truck-wash>

This vendor offers three types of large vehicle wash systems: rollover, drive-through and touchless.

Other Truck Wash Systems and System Components

Hotsy Wash Bay System: A Customized Washing Solution for Cleaning Vehicles and Heavy Equipment, Kärcher North America, 2016.

<http://www.hotsy.com/washBay/mainpage>

This vendor’s complete washing system “includes a stationary pressure washer of your choice located remotely on the premises, with a trolley system of hoses and wands that allow multiple users to clean at the same time. The pressure washer is turned on and off by a remote control station, and is typically connected to existing power and heating sources.”

Hydroblaster Pressure Washers: High Pressure Cleaning Systems, Hydro Engineering Inc., 2015.

<https://www.hydroblaster.com/products/pressure-washers.htm>

Pressure washers provided by this vendor can be powered by electric motors, gasoline or diesel engines, or pneumatic motors. The vendor offers electric-powered and engine-driven options for both hot and cold water; trailer-mounted systems and remote control stations are also available.

Steam Jenny, Jenny Products Inc., 2000.

<http://www.steamjenny.com/>

This vendor provides steam cleaners and hot- and cold-water pressure washers that are used in some respondents' wash bay operations.

3.3 Chemical Treatments

Several respondents reported the use of some type of chemical agent to reduce corrosion or otherwise protect winter maintenance equipment. Highlighted below are products used by Iowa and Tennessee DOTs.

Lubra-Seal, Rhomar Industries, 2016.

<http://rhomar.com/products/lubra-seal/>

As the vendor describes it, this blend of sealants and lubricants “goes on your salt spreaders as a black liquid that dries to form a thin, non-tacky, flexible polymer skin, which does not wash off. This polymer skin works by blocking out oxygen, moisture and salt residue, completely protecting your salt spreader from rust and corrosion damage during summer storage.”

Neutro-Wash, Rhomar Industries, 2016.

<http://rhomar.com/products/neutro-wash/>

This vendor website indicates that this product “eliminates rust & corrosion damage to your fleet by completely removing the corrosive white salts residue from your fleet caused by salt, salt brine and liquid chlorides.”

Salt-Away, Salt-Away Products, 1994.

<http://www.salt-awayproducts.com/>

Initially developed to flush salt from salt-water marine engines and remove salt from other equipment used in salt water, this water-based, biodegradable product “contains properties that dissolve, release and remove salt crystals from any surface.”

3.4 Managing Wastewater

The national guidance presented below offers best practices for a targeted use of recycled wash bay wastewater (salt brine production) and the handling of wash bay wastewater more broadly. State practices are highlighted in an Ohio DOT report that examines wastewater disposal alternatives and in documents that offer more targeted examinations of practices in Indiana, Massachusetts, New Jersey and Tennessee.

National Guidance

NCHRP Synthesis 449: Strategies to Mitigate the Impacts of Chloride Roadway Deicers on the Natural Environment, Laura Fay, Xianming Shi and Jiang Huang, April 2013.

http://onlinepubs.trb.org/onlinepubs/nchrp/nchrp_syn_449.pdf

This synthesis of best practices discusses making salt brine from recycled vehicle wash bay water (see page 92 of the report; page 102 of the PDF). Following that discussion is a list of references to gather further information on this topic.

Compendium of Best Management Practices for Environmental Compliance and Stewardship at Highway Transportation Maintenance Facilities, AASHTO Standing Committee on the Environment, November 2009.

[http://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp25-25\(46\)_FR.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/nchrp25-25(46)_FR.pdf)

This compendium of best practices addresses 19 major topics. Among the subtopics addressed in Section 4.1.3, Vehicle and Equipment Washing, which begins on page 16 of the report (page 32 of the PDF), are sanitary sewer connections, discharge to surface water, “no-discharge” management techniques, and wash water recycling systems.

State Practices

Indiana

“Indiana DOT Invests in Improved Salt Storage,” *Salt & Highway Deicing*, Salt Institute Newsletter, First Quarter 2010.

<http://www.saltinstitute.org/wp-content/uploads/2013/06/Salt-and-Highway-First-qtr-2010.pdf> (see page 1)

This article describing new covered buildings to be used by Indiana DOT for salt storage also addresses the vehicle wash facility in each building, including design, equipment and the handling of wash bay wastewater. Later in the newsletter (see page 4), this description of a Tennessee DOT wastewater processing system appears:

Like INDOT, Tennessee DOT (TDOT) has installed vehicle wash water processing systems at many of its wash facilities. Their system captures and cleans wash water for reuse as salt brine make-up water. In order to ensure that the wash water is relatively free of oil and other debris (which could clog the salt brine dispersion equipment), TDOT has installed oil/water separators and grit chambers at the wash bays. The water is also filtered through an automated, self-cleaning filtration system which uses filter paper to remove small particles. Following the filtering of the wash water, the water is pumped and stored in holding tanks and pumped or transported by truck to the brine mixing area. TDOT has installed high pressure, low volume washing facilities in order to both reduce the amount of water needed for washing and to avoid overloading the holding tanks. Moreover, the wash pads are under cover to prevent precipitation from entering the drains.

Massachusetts

SOP 14: Municipal Vehicle Washing Procedures, Standard Operating Procedures, Central Massachusetts Regional Stormwater Coalition, undated.

http://centralmastormwater.org/Pages/crsc_toolbox/Municipal%20Vehicle%20Wash%20SOP_FINAL.pdf

This procedure outlines procedures for outdoor and indoor washing of municipal vehicles, with specific direction for washing heavy vehicles. Related procedures include:

- **SOP 3: Catch Basin Inspection and Cleaning**, Standard Operating Procedures, Central Massachusetts Regional Stormwater Coalition, undated.
http://centralmastormwater.org/Pages/crsc_toolbox/Catch%20Basin%20Inspection%20SOP_FINAL.pdf

- **SOP 11: Oil/Water Separator (OWS) Maintenance**, Standard Operating Procedures, Central Massachusetts Regional Stormwater Coalition, undated.
http://centralmastormwater.org/Pages/crsc_toolbox/Oil%20Water%20Separator%20Maintenance%20SOP_FINAL.pdf

New Jersey

Salt Runoff Collection System, Eugene Golub, Robert Dresnack, Walter Konon, Jay Meegoda and Taha Marhaba, New Jersey Department of Transportation, November 2008.

<http://www.nj.gov/transportation/refdata/research/reports/FHWA-NJ-2003-026.pdf>

One of the objectives of this study was to develop methods to prevent, control or treat runoff at truck washing facilities at existing maintenance yards without endangering the environment. Truck washing options, from the least to most expensive, begin on page 30 of the report (page 35 of the PDF). Plans and associated costs for each alternative begin on page 34 of the report (page 39 of the PDF).

Ohio

Snow Removal Wastewater Disposal Alternatives, Christopher M. Miller, William H. Schneider IV, Marla J. Kennedy and Sarah Sullivan, Ohio Department of Transportation, January 2014.

http://www.dot.state.oh.us/Divisions/Planning/SPR/Research/reportsandplans/Reports/2014/Environmental/134629_FR.pdf

From the abstract:

Management of truck wash water generated at DOT maintenance facilities without access to sanitary sewer can be costly. Strategies for managing this waste stream, including collection and direct disposal, reuse with and without treatment, and tying into the sanitary sewer were identified and evaluated. The results of truck wash water quality monitoring at 24 maintenance facilities indicated that heavy metals concentrations exceeded the established reuse limits in Ohio at many garages. Pilot scale testing indicated that media filtration and particulate settling may be adequate to reduce heavy metals concentrations to acceptable levels for reuse of wash water.

See page 181 of the PDF for results of telephone and email contacts made to 17 states. A presentation of report results is available

at http://www.dot.state.oh.us/Divisions/Planning/SPR/Research/Training/Documents/2014_Presentations/134629ResultsPres.pdf.

3.5 State and Municipal Wash Bay Plans and Specifications

Specifications for the construction of truck wash buildings and the washing systems to be housed in them are provided below for projects in Connecticut, Delaware, Idaho, Missouri, New Jersey and New York.

Connecticut

Request for Proposals: Public Works Truck Wash: Mechanical and Wash System Design and Construction, Department of Public Works, Town of Simsbury, Connecticut, 2016.

http://www.simsbury-ct.gov/sites/simsburyct/files/uploads/bid_truck_wash_mechanicals_final_7-21-16_0.pdf

From the project overview:

The Town of Simsbury is soliciting proposals for the design and construction of all mechanical and wash systems to provide fully operational, drive through truck wash. The project will involve

designing and constructing the mechanical and wash systems for a drive through vehicle truck wash, using existing pumps, motors and accessories from an Inter-Clean Bus Wash and new components as necessary to provide a fully functional wash system. The contractor will have the option of using the existing equipment from an Inter-Clean bus wash or taking the equipment for the salvage value.

Delaware

Bid Proposal: Magnolia Truck Wash, Addendum Number 1, Delaware Department of Transportation, advertisement date June 13, 2016.

<http://gssdocs.deldot.delaware.gov/bids/T201680102.01%20Add1%20letter.pdf>

This bid proposal includes specifications for both the truck wash building to be constructed in Kent County, Delaware, and the automatic wash system the new building will house. The wash system, more fully described on page 6 of the PDF, will be a “completely automatic, touchless heavy-duty salt truck vehicle wash system with a special heavy duty entrance de-mucking system which washes the salt from the front, roof, rear, sides and chassis of the Owner’s fleet and other specified vehicles in drive-through mode.”

Related Resources:

Construction Plans: Magnolia Truck Wash, Delaware Department of Transportation, undated.

<http://gssdocs.deldot.delaware.gov/bids/T201680102%20-%20PLANS.pdf>

These plans are for the construction of a truck wash building in Kent County, Delaware.

Bid Status Details for Magnolia Truck Wash, Bid Solicitation Details, State of Delaware, undated.

http://bids.delaware.gov/bids_detail.asp?i=3887&DOT=Y

This web page provides links to all bidding documents related to the proposed Magnolia Truck Wash.

Idaho

Pressure Washer Wash Bay System, Informal Bid Request, Idaho Transportation Department, December 2015.

<http://www.itd.idaho.gov/adminservices/nonhwyconstructionprojects/PDFS/F131387D6PressureWasherWashBaySystem.pdf>

This detailed scope of work identifies the equipment needed, including plans, to install two pressure-washer wash bay systems in a fully functional maintenance building that is already supplied with electricity, natural gas, sewer, water, plumbing and heat.

Missouri

Index of Drawings: Concrete Block Truck Wash, St. Louis District, Missouri Department of Transportation, August 2015.

http://www.modot.org/business/contractor_resources/documents/BarrettStationTruckWashPlans.pdf

These plans for a truck wash in Missouri provide specifications for the building, heating, ventilation and air conditioning, and plumbing and electrical requirements.

Bid Form: New Self-Service Car Wash Bay, Missouri Department of Transportation, July 2014.

http://www.modot.org/business/contractor_resources/gs_bidding/D1/documents/NW-15-005SELFSERVICECARWASH.pdf

This bid form provides the specifications for a new self-service car wash bay to be installed in Missouri DOT’s Northwest District.

New Jersey

Scope of Work: Wash Bay Installation, New Jersey Department of Transportation Headquarters Complex, State of New Jersey, March 2012.

<http://www.state.nj.us/treasury/dpmc/sow/FINAL%20SOW/T0475-00-Fernwood%20Wash%20Bay%20Installation%20Final.pdf>

This scope of work describes a new building that will house a wash bay with an automatic fixed-arch drive-through wash system that includes a filtration and recycle system. The document includes this description of the proposed system (see page 13):

The automatic fixed arch drive through wash system should be ‘touchless’, consisting of high pressure rotary and stationary nozzles on a fixed frame and a fixed undercarriage wash. The system should also include low pressure, high volume manual hose stations on each side of the bay for rinsing the undersides of truck beds and areas that cannot fully be reached by the automatic system. The system should utilize a fresh water detergent wash and fresh water final rinse to eliminate spotting. The remainder of the wash cycle should use reclaimed water. The specifications shall describe the preferred wash system and shall list the names of three equal manufacturers.

The wash water reclamation system should include sediment basins, filtration equipment, pH adjustment equipment and the ability to regulate the percentage of reclaimed water to fresh water in order to regulate the quality of the discharge water. The specifications shall describe the preferred water reclamation system and shall list the names of three equal manufacturers.

Scope of Work: Oil/Water Separator Consolidation and Wash Bay Renovation, New Jersey Department of Transportation Keasbey Repair Garage and Maintenance Facility, State of New Jersey, May 2012.

<http://www.state.nj.us/treasury/dpmc/sow/FINAL%20SOW/T0488-00%20Oil%20Water%20Separator%20Consolidation%20and%20Wash%20Bay%20Renovation%20Keasbey%20Final.pdf>

From the scope of work’s objective:

The objective of this project is to consolidate the existing floor drain systems at the Keasbey Repair Garage and Maintenance Facility by rerouting the floor drain system in the maintenance garage such that the outflow is directed to the floor drain system in the repair garage and to replace the in-ground oil-water separators which serve the repair garage and maintenance garage with a new above ground oil-water separator located inside the repair garage which will handle the outflow from both the repair garage and the maintenance garage.

The project will also involve the installation of a new floor sump and wash water reclamation system in the existing wash bay in the repair garage in order to reduce the amount of waste water from vehicle washing activities that is discharged into the municipal sanitary sewer.

New York

Proposal: Wash Bay Installation at Vehicle Storage Buildings at Henrietta and Batavia Maintenance Sites, New York State Thruway Authority/Canal Corporation, August 2016.

http://www.thruway.ny.gov/netdata/contractors/documents/d214509_tab16-34a_proposal-book-1-of-1.pdf

This document includes specifications and bid proposal worksheets for a project to install a vehicle wash bay system at two existing vehicle storage buildings. One of the sites will include an above-grade oil/water separator.

3.6 Other Guidance

“Vehicle Washing Strategies: Deciding if Recycling Equipment Is Worth the Extra \$30,000 Investment,” Angus W. Stocking, *Public Works*, March 6, 2014.

http://www.pwmag.com/fleets/vehicle-washing-strategies_o

While this article addresses the washing of collection, transfer and recycling vehicles, its recommendations will be of interest to agencies washing other types of large vehicles. The authors note that while “[r]eclaiming washwater cuts per-wash consumption by 80% to 90%,” determining whether installation of wastewater recycling equipment is a good investment “depends on vehicle types, maintenance requirements, and—first and foremost—volume.”

“Considerations for Vehicle Wash Bays,” Jeff Oertel, Oertel Architects, *Latest News*, American Public Works Association (Minnesota Chapter), September 9, 2013.

<https://www.apwa-mn.org/news/Latest-News/view/106>

This article addresses what the author identifies as the main components of a wash bay—equipment, a sediment interceptor, building materials and heat/ventilation. The author considers both manual and automatic systems, noting that “[t]he best wash bays have both. A properly designed manual bay would include pressure washers along with higher volume fire hoses.”

Appendix A

Survey Questions

The following survey was distributed to the primary winter maintenance contacts in all 50 state DOTs to gather information for this synthesis report. See [Appendix B](#) for the full text of survey responses.

1. Which of the following practices does your agency use for the routine washing of snowplow trucks? Check all that apply.
 - Use of in-house wash bays.
 - Use of off-site commercial washing facilities.
 - In-house washing without a wash bay.
2. If you do not use in-house wash bays, do you have any plans to install them?

Use of In-House Wash Bays

1. How many wash bays does your agency maintain?
2. When are the wash bays used?
3. How frequently do you run trucks through a wash bay?
4. Please identify the features of your wash bay(s) by checking all that apply.
 - Indoor.
 - Outdoor.
 - New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Portable wash bay.
 - Nonautomated wash bay.
 - Pull-on/pull-through wash bay.
 - Lighted wash bay.
 - Other (please specify).
5. How long is the wash cycle time for your wash bay(s)?
6. Please provide a brief description of your wash bay operation. (Treatment of wash bay wastewater is addressed in Questions 7 and 8.)
7. Please identify the practices you use to manage the wastewater generated by your wash bay operation; check all that apply.
 - Discharge to leach field.
 - Discharge to retention pond.
 - Discharge to sanitary sewer.
 - Discharge to storm sewer.
 - Evaporator system.
 - Filtration.
 - Oil and grease removal.
 - Oil/water separator.

Appendix A Survey Questions

- Off-site disposal.
- On-site storage in holding tank.
- Reuse for brine production.
- Reuse for truck washing.
- Reuse for other purpose (please describe).

(Optional) Please provide details of any other practices you use to manage wash bay wastewater.

8. Is your treatment of wash bay wastewater guided by regulations or environmental best practices identified by your agency? Please describe.

(Optional) Please use this space to provide additional information about your agency's handling of wash bay wastewater.

9. Please describe the installation requirements for your wash bay(s) for both new construction and the retrofitting of existing spaces, as applicable. Include in your response any drainage requirements and the water pressure and service lines required.

10. What are the costs associated with your wash bay(s)?

Installation costs.

Operating costs.

Use of Off-Site Commercial Washing Facilities

1. Please describe the type of commercial wash bay you use.
2. How frequently do you run trucks through commercial wash bays?
3. What is the cost for commercial washing (per truck)?

Assessing Truck Washing Practices

1. Please rate the effectiveness of your agency's truck washing practices in preventing or reducing corrosion on snowplow trucks. (1 = not at all effective; 5 = very effective)
 - In-house wash bays.
 - Off-site commercial washing facilities.
 - In-house washing without a wash bay.
2. What successes have you experienced in connection with your agency's truck washing practices? Please provide details for each practice you use.
 - In-house wash bays.
 - Off-site commercial washing facilities.
 - In-house washing without a wash bay.
3. What challenges have you experienced in connection with your agency's truck washing practices? Please provide details for each practice you use.
 - In-house wash bays.
 - Off-site commercial washing facilities.
 - In-house washing without a wash bay.
4. Please use this space to provide any comments or additional information about your answers.

Appendix B Survey Results

The full text of survey responses is provided below. For reference, an abbreviated version of each question is included before the response. The full question text appears in [Appendix A](#). Sections of the survey and specific questions have been omitted if not relevant to the respondent or the respondent elected to skip that section or question.

Alaska

Contact: Todd Hanley, Heavy Equipment Training Coordinator, Alaska Department of Transportation and Public Facilities, 907-269-5613, todd.hanley@alaska.gov.

1. **Truck washing practices used:**

- Use of in-house wash bays.
- In-house washing without a wash bay.

Use of In-House Wash Bays

1. **Number of wash bays:** 20-25.

2. **When used:** Day and night.

3. **Frequency of use:** Every day during the summer months and only occasionally in the winter due to freezing.

4. **Wash bay features:**

- Indoor.
- Outdoor.
- New construction.
- Retrofit of existing space.
- Permanent wash bay.
- Nonautomated wash bay.
- Pull-on/pull-through wash bay.
- Lighted wash bay.

5. **Length of wash cycle time:** 1-2 minutes for the automated version. Nonautomated is simply a manually operated pressure washer, so however long you want to spend washing the vehicle.

6. **Description of wash bay operation:** The automated wash requires you to drive through very slowly. The stages are: high-pressure water, soap, high-pressure water and then a rinse.

7. **Practices used to manage the wash bay wastewater:**

- Discharge to retention pond.
- Discharge to storm sewer.
- Filtration.
- Oil/water separator.
- On-site storage in holding tank.
- Reuse for truck washing.

8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?** I don't have a definite answer on this.

Appendix B Survey Results

9. **Wash bay installation requirements:** The new construction is usually incorporated within a new building project. Sheetrock protection is occasionally installed such as aluminum or plastic sheets. Oil separators for the wastewater are often installed but not in all cases.
10. **Wash bay costs:**
 - Installation costs:** In many cases the wash bay is usually shared as a warm storage bay, so the main cost is the hot-water pressure washer.
 - Operating costs:** The operating costs are not separated out but included within the building expenses.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 3.
 - In-house washing without a wash bay:** 2.
2. **Successes:**
 - In-house wash bays:** As a designated in-house wash bay, they tend to be fairly effective. The more convenient they are, the more they get used. The automated one is good for driving through at the end of the day during the summer months.
 - In-house washing without a wash bay:** These tend not to be used as much because many times it requires moving other equipment to use them. During the summer months, washing vehicles outside in designated areas is more convenient.
3. **Challenges:**
 - In-house wash bays:** Keeping the drains and walls clean always seems to labor-intensive. When using a diesel-power[ed] pressure washer, making sure the wash bay is ventilated properly has also been problematic. When the outside temperature gets below 20 degrees F, it creates lots of steam making it difficult to see. Pumping and cleaning holding tanks is labor-intensive.
 - In-house washing without a wash bay:** During the summer months using hoses and pressure washers works well, but obviously this is not an option when the temperature starts dropping in the fall.

Arizona

Contact: Mark Trennepohl, Winter Operations Manager, Arizona Department of Transportation, 602-712-8277, mtrennepohl@azdot.gov.

1. **Truck washing practices used:**
 - Use of in-house wash bays.

Use of In-House Wash Bays

1. **Number of wash bays:** 24.
2. **When used:** Day and night.
3. **Frequency of use:** After each winter weather event.
4. **Wash bay features:**

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- Indoor.
 - New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** Manual.
6. **Description of wash bay operation:** Bays are built specifically for our plow trucks. There are 20-foot-high walkways at the front and on both sides of the bay. Systems are not automated.
7. **Practices used to manage wash bay wastewater:**
- Discharge to storm sewer.
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**
Both regulations and environmental best practices by our agency. A BMP [best management practices] manual has been developed. [See Related Resource below.] Maricopa and Pima counties are heavily regulated environmentally due to population density. However, the more rural counties/towns are not so heavily regulated, which allows us to take wastewater to sewage provided we're using a sump to separate heavy metals, oil, etc.
10. **Wash bay costs:**
Installation costs: \$500,000 new construction.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
In-house wash bays: 2.
2. **Successes:**
In-house wash bays: We have either updated existing wash bays or new construction for a total of 24 wash bays across the state. We have not implemented a program for washing our plow trucks. This is coming.

Related Resource:

Best Practices for ADOT Vehicle and Equipment Wash Facilities, Arizona Department of Transportation, June 2015.

See [Appendix C](#).

This document describes the typical wash bay facility, applicable regulations, monitoring and maintenance.

California

Contact: Chris Smith, Winter Operations Chief, California Department of Transportation, 916-653-8782, chris.smith@dot.ca.gov.

1. **Truck washing practices used:**
- Use of in-house wash bays.

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Use of In-House Wash Bays

1. **Number of wash bays:** 200.
2. **When used:** Day and night.
3. **Frequency of use:** Depends on intensity of the storm and how dirty equipment gets in normal operation.
4. **Wash bay features:**
 - Indoor.
 - New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** Manual.
6. **Description of wash bay operation:** Pull equipment in, wash it, back equipment out.
7. **Practices used to manage wash bay wastewater:**
 - Discharge to sanitary sewer.
 - Evaporator system.
 - Filtration.
 - Oil and grease removal.
 - Oil/water separator.
 - Reuse for brine production.
 - Reuse for truck washing.
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**
Our internal policy: Vehicle and equipment washing is allowed only at designated rinsing areas, wash racks or other designated areas. All engine compartment and undercarriage rinsing/washing must be performed within a wash rack facility. The district maintenance stormwater coordinator will approve or provide input on the proper location for a designated rinsing area.
9. **Wash bay installation requirements:** This varies greatly depending on where in the state you are. I will email additional info on design. [See Related Resource below.]
10. **Wash bay costs:**
 - Installation costs:** We took an average of seven different projects that ranged from \$500,000 for a simple pad and canopy in Los Angeles to just under \$6,000,000 for a new enclosed wash rack in snow country. The average cost we came up with is \$2,100,000.
 - Operating costs:** Not tracked.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 3.
 - In-house washing without a wash bay:** 1.

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2. Successes:

In-house wash bays: We believe it helps keep corrosion down. Also safety equipment such as lights and stickers are easier to see.

In-house washing without a wash bay: Basically just a rinse, not useful for anything larger than a pickup.

3. Challenges:

In-house wash bays: Having enough time for everyone on the shift to wash (we generally wash equipment at the end of a shift).

In-house washing without a wash bay: Just not effective.

Related Resource:

High-Pressure Washer Room and Covered Vehicle Wash Rack/Mud Rinse, Appurtenant Building Space, Maintenance Station Design Manual, California Department of Transportation, December 2002.

See [Appendix D](#).

This document provides design details for the typical Caltrans high-pressure wash bay and covered wash rack, including mechanical and electrical systems, area and height standards, and materials and finishes.

Colorado

Contact: Kyle Lester, Director of Highway Maintenance, Colorado Department of Transportation, 303-512-5218, kyle.lester@state.co.us.

1. Truck washing practices used:

- Use of in-house wash bays.
- Use of off-site commercial washing facilities.
- In-house washing without a wash bay.

2. **Plans to install wash bays?** Yes. In-house wash bays at all 254 locations. This will be a phased rollout over 10 years.

Use of In-House Wash Bays

1. **Number of wash bays:** 65.

2. **When used:** Day and night.

3. **Frequency of use:** Post-storm maintenance. Average month for every truck.

4. Wash bay features:

- Indoor.
- Outdoor.
- New construction.
- Retrofit of existing space.
- Permanent wash bay.
- Nonautomated wash bay.
- Lighted wash bay.

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- Recycle wash bays. The water is filtered and reused.
5. **Length of wash cycle time:** 1 hour.
 6. **Description of wash bay operation:** If city sewer, the water is dumped. If leach field, the water is filtered for heavy metals and chlorides, then reused.
 7. **Practices used to manage wash bay wastewater:**
 - Discharge to leach field.
 - Discharge to sanitary sewer.
 - Filtration.
 - Reuse for brine production.
 - Reuse for truck washing.
 - CDOT has one wash bay that turns the wash water to salt brine.
 10. **Wash bay costs:**
 - Installation costs:** \$100,000 on average.
 - Operating costs:** \$5,000.

Use of Off-Site Commercial Washing Facilities

1. **Type of commercial wash bay used:** Truck wash facilities.
2. **Frequency of use:** Monthly.
3. **Cost per truck:** [\$]25.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 4.
 - Off-site commercial washing facilities:** 3.
 - In-house washing without a wash bay:** 1.

Connecticut

Contact: John DeCastro, Transportation Maintenance Manager, Connecticut Department of Transportation, 860-594-2614, john.decastro@ct.gov.

1. **Truck washing practices used:**
 - Use of in-house wash bays.
 - In-house washing without a wash bay.

Use of In-House Wash Bays

1. **Number of wash bays:** 63 currently that are built in to our facilities.
2. **When used:** Day and night.
3. **Frequency of use:** After storm events and as needed.

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4. **Wash bay features:**
 - Indoor.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** Typical truck washing (manually) 45 minutes to 1 hour.
6. **Description of wash bay operation:** Manual washing of trucks. No automation.
7. **Practices used to manage wash bay wastewater:**
 - Discharge to sanitary sewer.
 - Oil/water separator.
 - On-site storage in holding tank.
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**
Yes, we utilize best practices. Our wastewater goes into a holding tank or sanitary sewer.
9. **Wash bay installation requirements:** During capital improvements to our facilities we go through a thorough process of evaluating the best location and needs looking at all impacts.
10. **Wash bay costs:**
 - Installation costs:** Varies.
 - Operating costs:** Varies.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 5.
 - In-house washing without a wash bay:** 4.
2. **Successes:**
 - In-house wash bays:** Very effective. We can clean our equipment thoroughly.
 - In-house washing without a wash bay:** Limited as we cannot raise our truck bodies fully. Pressure is also reduced from hoses.
3. **Challenges:**
 - In-house wash bays:** With our systems in place we have minimal challenges. Width of wash bays. Hose systems.
 - In-house washing without a wash bay:** Pressure from hoses. Typically hoses are not high-pressure.
4. **Comments or additional information:** We are still in the process of installing additional wash bays. As we upgrade our facilities all will be equipped with wash bays.

Appendix B Survey Results

Delaware

Contact: Alastair Probert, District Engineer, Delaware Department of Transportation, 302-853-1305, alastair.probert@state.de.us.

- 1. Truck washing practices used:**
 - Use of in-house wash bays.
 - In-house washing without a wash bay.
- 2. Plans to install in-house wash bays?** Install commercial-type automatic truck wash systems. Water will be fresh water and discharged to local sanitary sewer system. [See page 31 of this synthesis report for the bidding documents for this project.]

Use of In-House Wash Bays

- 1. Number of wash bays:** 4.
- 2. When used:** Day and night.
- 3. Frequency of use:** After each event.
- 4. Wash bay features:**
 - Indoor.
 - Permanent wash bay.
 - Lighted wash bay.
 - Automated system.
- 5. Length of wash cycle time:** About 5 minutes.
- 6. Description of wash bay operation:** Apply soap, underbody, side and top high-pressure arches; rinse arch. All water is fresh water.
- 7. Practices used to manage wash bay wastewater:**
 - Discharge to sanitary sewer.
 - Discharge to storm sewer.
 - Oil/water separator.

(Optional) Other wastewater management practices: Sump pits, Stormceptor [an oil/grit separator; see <http://www.imbriumsystems.com/stormwater-treatment-solutions/stormceptor-systems>].

- 8. Treatment of wash bay wastewater guided by regulations or environmental best practices?** Yes.
- 9. Wash bay installation requirements:** Wash water needs to be conveyed to a contained storm water pond or to sanitary sewer.
- 10. Wash bay costs:**
 - Installation costs:** \$300,000 for fully automated wash system and structure.
 - Operating costs:** Unknown.

Assessing Truck Washing Practices

- 1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**

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In-house wash bays: 5.

In-house washing without a wash bay: 3.

2. Successes:

In-house wash bays: Use only fresh water, make sure you pick the right soaps and have the right dwell time.

In-house washing without a wash bay: Encourage underbody washing.

3. Challenges:

In-house wash bays: Environmental regulations.

In-house washing without a wash bay: Environmental regulations.

Idaho (Response 1)

Contact: Shawn Webb, District Maintenance Coordinator, Idaho Transportation Department, 208-886-7808, shawn.webb@itd.idaho.gov.

1. Truck washing practices used:

- Use of in-house wash bays.
- In-house washing without a wash bay.

2. Plans to install in-house wash bays? Yes. We have plans to build a truck washing building with elevated platform, pressure washer and high-volume hoses this year at our district shop location.

Use of In-House Wash Bays

1. Number of wash bays: Four exterior wash pads; eight inside locations not designated only for washing.

2. When used: Day and night.

3. Frequency of use: Depending upon storm frequency, daily or weekly.

4. Wash bay features:

- Indoor.
- Outdoor.
- New construction.
- New construction will be pull-through configuration with manual washing only.

5. Length of wash cycle time: No automated wash bays; manual wash times are generally 20-30 minutes.

6. Description of wash bay operation: Two wash pads have high-volume hoses and pressure washers; two are just high-volume hoses. All other locations use high-volume [hoses] outside garage bay and bring inside for final wash.

7. Practices used to manage the wash bay wastewater:

- Discharge to leach field.
- Discharge to retention pond.
- Discharge to sanitary sewer.
- Oil and grease removal.

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- Oil/water separator.
 - On-site storage in holding tank.
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**
We strive to follow best management practices identified in association with local and state environmental regulatory agencies.
9. **Wash bay installation requirements:** We are required to retain all wastewater on site in evaporative ponds or other containments to be tested and disposed of. For future developments, or if attached to municipal sewage systems, [we] outline our best management practices to pretreat the wastewater and receive a “will serve” letter from the receiving municipality before construction and/or connection to their system.
10. **Wash bay costs:**
Installation costs: \$350,000 for current project.
Operating costs: Unknown at this time.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
In-house wash bays: 3.
In-house washing without a wash bay: 3.
2. **Successes:**
In-house wash bays: We have shown improvement in corrosion problems since we have installed more high-volume water hose connections at our maintenance shed locations.
In-house washing without a wash bay: The exterior wash pad locations seem to [be] most effective to allow the crews to remove the majority of the salt/sand buildup before final washing inside. Because the pads are easier to clean the built-up material with a loader than in front of garage bays or the interior floors/drains, the crews are more likely to wash the trucks more often this way.
3. **Challenges:**
In-house wash bays: Cleanup of floors and drains.
In-house washing without a wash bay: Freezing conditions making the surfaces on and around trucks slick and unsafe at pad sites, and freez[es] water hoses at times.
4. **Comments or additional information:** We are hopeful the facility we are building with the elevated washing platform and drive-through configuration will encourage more and safer washing practices. If this design works well, we plan on building another such facility in the east end of our district.

Idaho (Response 2)

Contact: Steve Gertonson, Operations Manager, District 5, Idaho Transportation Department, 208-239-3309, steve.gertonson@itd.idaho.gov.

1. **Truck washing practices used:**
- In-house washing without a wash bay.

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2. Plans to install in-house wash bays? No.

Assessing Truck Washing Practices

1. Effectiveness of truck washing practices in preventing or reducing corrosion on snowplow trucks: (1 = not at all effective; 5 = very effective):

In-house washing without a wash bay: 4.

2. Successes:

In-house washing without a wash bay: Pressurized heated washers for use in the winter.

3. Challenges:

In-house washing without a wash bay: Tough to get them to commit to performing the washing in winter weather. The heated water pressure washers helped getting commitment to perform the washing.

Idaho (Response 3)

Contact: Kori Hansen, Special Maintenance Foreman, Idaho Transportation Department, 208-705-6611, korihansen@itd.idaho.gov.

1. Truck washing practices used:

- In-house washing without a wash bay.

2. Plans to install in-house wash bays? No.

Assessing Truck Washing Practices

1. Effectiveness of truck washing practices in preventing or reducing corrosion on snowplow trucks: (1 = not at all effective; 5 = very effective):

In-house washing without a wash bay: 5.

2. Successes:

In-house washing without a wash bay: We have this.

3. Challenges:

In-house washing without a wash bay: We have this in [our] maintenance buildings.

Illinois (Response 1)

Contact: James Stumpner, Bureau Chief of Maintenance, Illinois Department of Transportation, 847-705-4170, james.stumpner@illinois.gov.

1. Truck washing practices used:

- Use of in-house wash bays.

Use of In-House Wash Bays

1. Number of wash bays: 26.
2. When used: Day and night.
3. Frequency of use: As needed. During snow and ice season, daily.

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4. **Wash bay features:**
 - Indoor.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** Washing is done with a handheld power washer. Length of time varies.
6. **Description of wash bay operation:** Power washer with handheld wand using heated water and commercial truck washing soap.
7. **Practices used to manage wash bay wastewater:**
 - Discharge to sanitary sewer.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 4.
 - In-house washing without a wash bay:** 2.
2. **Successes:**
 - In-house wash bays:** Excellent results for employees that put forth the effort necessary.
 - In-house washing without a wash bay:** Very limited results in winter operations due to cold weather.
3. **Challenges:**
 - In-house wash bays:** Limited access with only one wash bay for each maintenance facility.
 - In-house washing without a wash bay:** Limited access to all parts of the truck.

Illinois (Response 2)

Contact: Tom Hufnagel, Acting Operations Engineer, District 3, Illinois Department of Transportation, 815-434-8449, thomas.hufnagel@illinois.gov.

1. **Truck washing practices used:**
 - In-house washing without a wash bay.
2. **Plans to install in-house wash bays?** No.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion on snowplow trucks: (1 = not at all effective; 5 = very effective):**
 - In-house washing without a wash bay:** 4.
2. **Successes:**
 - In-house washing without a wash bay:** Some undercarriage wash systems have been

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utilized.

3. Challenges:

In-house washing without a wash bay: Varying degrees of success with wash additives.
Cost of wash additives.

Illinois (Response 3)

Contact: David Speicher, District 5 Operation Engineer, Illinois Department of Transportation,
217-466-7234, david.speicher@illinois.gov.

1. Truck washing practices used:

- Use of in-house wash bays.

Use of In-House Wash Bays

1. **Number of wash bays:** 11.

2. **When used:** Day and night.

3. **Frequency of use:** After every storm.

4. **Wash bay features:**

- Indoor.
- Retrofit of existing space.
- Permanent wash bay.
- Lighted wash bay.

5. **Length of wash cycle time:** 15-30 minutes.

6. **Description of wash bay operation:** Most are heated water power washers with handheld wands.

7. **Practices used to manage wash bay wastewater:**

- Discharge to leach field.
- Discharge to sanitary sewer.
- Oil/water separator.

8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**

Yes, generally accepted practice is to use an oil/water separator discharging to a municipal sanitary sewer. This cannot be done in all cases and we continue to look for ways to treat wash bay wastewater at rural locations.

9. **Wash bay installation requirements:** All of our wash bays are pretty old. They were either built when the facility was first constructed or added to an existing bay. We have added oil/water separators at all facilities.

10. **Wash bay costs:**

Installation costs: Unknown.

Operating costs: Unknown.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all**

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effective; 5 = very effective):

In-house wash bays: 3.

2. Successes:

In-house wash bays: We do have a location with an undercarriage wash that works very well. We are looking to add this feature at more sites.

Indiana

Contact: Tony McClellan, Deputy Commissioner, Seymour District, Indiana Department of Transportation, 812-524-3702, tmcclellan@indot.in.gov.

1. Truck washing practices used:

- Use of in-house wash bays.
- Use of off-site commercial washing facilities.
- In-house washing without a wash bay.

2. Plans to install wash bays? Yes. We are continuously adding wash bays as new unit and subdistrict facilities are constructed. We are also adding wash bays to existing facilities when money is available.

Use of In-House Wash Bays

1. Number of wash bays: Approximately 50.

2. When used: Day and night.

3. Frequency of use: Depends on breaks with snow storms. We try to wash after each storm if we have a break.

4. Wash bay features:

- Indoor.
- New construction.
- Retrofit of existing space.
- Permanent wash bay.
- Portable wash bay.
- Nonautomated wash bay.
- Pull-on/pull-through wash bay.
- Lighted wash bay.

5. Length of wash cycle time: Varies.

6. Description of wash bay operation: Some wash bays have underbody wash permanently installed; some have portables. All bays are equipped with hot water and pressure washers.

7. Practices used to manage wash bay wastewater:

- Discharge to sanitary sewer.
- Oil/water separator.
- On-site storage in holding tank.

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- Reuse for brine production.
- 8. Treatment of wash bay wastewater guided by regulations or environmental best practices?**
Regulations and best practices.
 - 9. Wash bay installation requirements:** We require connection to sanitary sewer. We also require oil/water separators.
 - 10. Wash bay costs:**
 - Installation costs:** Do not have this information readily available.
 - Operating costs:** Do not have this information readily available.

Use of Off-Site Commercial Washing Facilities

- 1. Type of commercial wash bay used:** Usually at truck stops.
- 2. Frequency of use:** As often as we can after storms. Drive time to and from commercial facilities has to be taken into account, as well if there are impending storms.
- 3. Cost per truck:** Do not have this information readily available.

Assessing Truck Washing Practices

- 1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 4
 - Off-site commercial washing facilities:** 2.
 - In-house washing without a wash bay:** 2.
- 2. Successes:**
 - In-house wash bays:** We are able to recycle wash water.
 - Off-site commercial washing facilities:** Have had better luck with this than in-house washing without a wash bay.
 - In-house washing without a wash bay:** This is better than nothing, but not a lot of success with this practice.
- 3. Challenges:**
 - In-house wash bays:** Water supply.
 - Off-site commercial washing facilities:** Travel time to and from facility.
 - In-house washing without a wash bay:** Environmental issues.

Iowa

Contact: Craig Bargfrede, Winter Operations Administrator, Iowa Department of Transportation, 515-290-2713, craig.bargfrede@dot.iowa.gov.

- 1. Truck washing practices used:**
 - Use of in-house wash bays.
 - In-house washing without a wash bay.
- 2. Plans to install in-house wash bays?** We would like to consolidate all washing activities into one or two bays in each garage.

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Use of In-House Wash Bays

1. **Number of wash bays:** Over 150.
2. **When used:** Day and night.
3. **Frequency of use:** During winter operations, after every storm event. Other times of the year they are brought through the wash bay on an as-needed basis.
4. **Wash bay features:**
 - Indoor.
 - Outdoor.
 - New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Pull-on/pull-through wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** Our wash bays are nonautomated so the wash cycle time is dependent on how long it takes to get the truck clean.
6. **Description of wash bay operation:** Because we have no automated wash bays, all trucks are hand-washed. Most garages have a power/pressure washer that is used to wash the trucks. We utilize various soap products during washing and many of our garages use the product Salt-Away [a commercial product designed to inhibit rusting and corrosion on all salt-exposed surfaces; see <http://www.salt-awayproducts.com/>] as a post-wash to remove as much salt as possible from the truck.
7. **Practices used to manage wash bay wastewater:**
 - Discharge to sanitary sewer.
 - Oil and grease removal.
 - Oil/water separator.
 - Reuse for brine production.
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**
We follow the Iowa Department of Natural Resources regulations.
9. **Wash bay installation requirements:** We require [a] minimum of a 2-inch service into the wash bay.
10. **Wash bay costs:**
 - Installation costs:** For a drive-through reclamation building/wash bay = \$350,000-\$400,000.
 - Operating costs:** Normal utility costs.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 5.
 - In-house washing without a wash bay:** 4.

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2. Successes:

In-house wash bays: It is not so much the bay as it is the practice of making sure that trucks [are] washed completely, especially after winter operations. We have also seen very good results in using Salt-Away as an additional salt removing and corrosion preventative.

Kansas

Contact: Clay Adams, Bureau Chief of Maintenance, Kansas Department of Transportation, 785-296-3233, clay@ksdot.org.

1. Truck washing practices used:

- Use of in-house wash bays.

Use of In-House Wash Bays

1. **Number of wash bays:** 110 +/-.
2. **When used:** Daytime.
3. **Frequency of use:** As need[ed] and after each winter storm event.
4. **Wash bay features:**
 - Indoor.
 - New construction.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** Ours are not automatic.
6. **Description of wash bay operation:** Back truck in. Lift hopper with hoist assembly, wash hopper and bed of truck, wash truck, put hopper back in truck and pull out. High-pressure hot water wash.
7. **Practices used to manage wash bay wastewater:**
 - Discharge to sanitary sewer.
 - Oil and grease removal.
 - Oil and grit removal chamber.
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**
All wash water must go to a sanitary sewer system.
9. **Wash bay installation requirements:** Mostly new stand-alone buildings. We are starting to incorporate the wash bay in any new subarea buildings where a wash bay is not present.
10. **Wash bay costs:**
 - Installation costs:** \$200,000.00 to \$300,000.00.
 - Operating costs:** Don't know.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**

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In-house wash bays: 4.

2. Successes:

In-house wash bays: Trucks are kept cleaner; employees have a safer place to clean truck.

In-house washing without a wash bay: Not allow[ed] in Kansas by our environmental agency.

3. Challenges:

In-house wash bays: The employees don't trust the hoist assembly in a wood truss roof. Moving to self-supporting hoppers to eliminate the need for hoists.

In-house washing without a wash bay: Not allow[ed] in Kansas by our environmental agency.

Kentucky

Contact: David Cornett, Assistant Director/Division of Maintenance, Kentucky Transportation Cabinet, 502-782-5578, davidp.cornett@ky.gov.

1. Truck washing practices used:

- In-house washing without a wash bay.

2. Plans to install in-house wash bays? No.

Assessing Truck Washing Practices

1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):

In-house washing without a wash bay: 4.

2. Successes:

In-house washing without a wash bay: We are maintaining acceptable chloride levels in accordance with our Storm Water Quality Management Plan [see <http://transportation.ky.gov/Stormwater/Documents/KYTC%20SWQMP.pdf>].

3. Challenges:

In-house washing without a wash bay: Keeping chloride materials contained during periods of heavy rainfall.

Maine

Contact: Brian Burne, Highway Maintenance Engineer, Maine Department of Transportation, 207-624-3571, brian.burne@maine.gov.

1. Truck washing practices used:

- Use of in-house wash bays.
- In-house washing without a wash bay.

2. Plans to install in-house wash bays? Yes. We install wash bays as we build new facilities.

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Use of In-House Wash Bays

1. **Number of wash bays:** Approximately 10.
2. **When used:** Nighttime.
3. **Frequency of use:** Following any storm.
4. **Wash bay features:**
 - Indoor.
 - Outdoor.
 - New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** All wash bays are manual. None are automated.
6. **Description of wash bay operation:** Pull truck in, close waterproof curtain, wash truck, water goes down drain and into a holding tank; holding tank effluent is hauled off and disposed of (unless connected to a sanitary sewer).
7. **Practices used to manage wash bay wastewater:**
 - Discharge to sanitary sewer.
 - Oil/water separator.
 - Off-site disposal.
 - On-site storage in holding tank.
 - Reuse for brine production.
 - We did try making salt brine for a while, but it was not cost-effective (or very pleasant, as the effluent smelled pretty bad).
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?** It is part of our floor drain tank policy.
9. **Wash bay installation requirements:** Drains in the floors, waterproof curtain that surrounds the bay, staging that allows access to the higher areas of the truck.
10. **Wash bay costs:**
 - Installation costs:** \$6,000 to \$8,000 above a regular bay.
 - Operating costs:** Unknown, as those costs are not separated out from the regular overall water and effluent disposal costs.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 3.
 - In-house washing without a wash bay:** 3.
2. **Successes:**

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In-house wash bays: They pretty much just do what they were intended to do.

3. Challenges:

In-house wash bays: Holding tanks can become expensive with a lot of washing.

4. Comments or additional information: Maine doesn't have much for commercial options for plow trucks.

Massachusetts

Contact: Bassam (Sam) Salfity, Lead State Snow and Ice Engineer, Massachusetts Department of Transportation, 857-368-9671, bassam.salfity@state.ma.us.

1. Truck washing practices used:

- Use of in-house wash bays [rinse only].
- In-house washing without a wash bay.

2. Plans to install in-house wash bays? No.

Use of In-House Wash Bays

1. Number of wash bays: 0.

2. When used: Daytime.

6. Description of wash bay operation: We only rinse at our depot.

7. Practices used to manage wash bay wastewater:

- Discharge to sanitary sewer.
- Oil and grease removal.
- Oil/water separator.
- Off-site disposal.
- On-site storage in holding tank.

Assessing Truck Washing Practices

1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):

Off-site commercial washing facilities: 1.

In-house washing without a wash bay: 2.

Michigan

Contact: Justin Droste, Asset Management Engineer, Michigan Department of Transportation, 517-636-0518, drostej@michigan.gov.

1. Truck washing practices used:

- Use of in-house wash bays.
- In-house washing without a wash bay.

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Use of In-House Wash Bays

2. **When used:** Day and night.
3. **Frequency of use:** Ideally after every shift, but can't always do that.
4. **Wash bay features:**
 - Indoor.
 - New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Pull-on/pull-through wash bay.
 - Lighted wash bay.
7. **Practices used to manage the wash bay wastewater:**
 - Discharge to sanitary sewer.
 - Filtration.
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?** I believe so.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 5.
 - In-house washing without a wash bay:** 3.

Minnesota

Contact: Brian Barott, Training Specialist, Minnesota Department of Transportation, 651-366-5247, brian.barott@state.mn.us.

1. **Truck washing practices used:**
 - Use of in-house wash bays.
 - In-house washing without a wash bay.

Use of In-House Wash Bays

1. **Number of wash bays:** 20.
2. **When used:** Day and night.
3. **Frequency of use:** After snow storms in winter and whenever needed in the summer months.
4. **Wash bay features:**
 - Indoor.
 - New construction.

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- Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** Washing is usually done by hand; one-half hour to one hour is average.
 6. **Description of wash bay operation:** Most are set up with a pressure washer. Hot water is optional and soap can be applied through the pressure wand. Bucket and hand washing is still performed if needed.
 7. **Practices used to manage wash bay wastewater:**
 - Discharge to leach field.
 - Discharge to retention pond.
 - Discharge to sanitary sewer.
 - Filtration.
 - On-site storage in holding tank.
 8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**
By state regulations and agency. At this point we are trying to minimize contamination by cleaning all salt off our trucks in the winter and using wash water sparingly.
 9. **Wash bay installation requirements:** Service lines are 3/4[-inch] pipe. Drainage requires catch basins.
 10. **Wash bay costs:**
 - Installation costs:** Varies.
 - Operating costs:** Varies.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 4.
 - In-house washing without a wash bay:** 3.
2. **Successes:**
 - In-house wash bays:** Faster cycle times for truck washing; cleaner windshields and mirrors providing some advantages in safety. Proper washing has slowed rust/component damage inherent in our driving environment. Standardizing our wash bay components helps speed wash time.
 - In-house washing without a wash bay:** Same as in-house wash bays.
3. **Challenges:**
 - In-house wash bays:** Excess water usage, improper washing of truck frame rails and salt-covered components.
 - In-house washing without a wash bay:** Excess over-spray. Salt, dirt and debris landing on other vehicles.

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Missouri

Contact: Jason Shafer, Assistant District Maintenance Engineer, Missouri Department of Transportation, 573-291-9665, jason.shafer@modot.mo.gov.

- 1. Truck washing practices used:**
 - Use of in-house wash bays.
 - Use of off-site commercial washing facilities.
 - In-house washing without a wash bay.
- 2. Plans to install wash bays?** Yes. We have a limited number of concrete pads utilized for washing. These have oil/water separation and these are connected to city sewer systems. Our long-range plan is to enclose these locations.

Use of In-House Wash Bays

- 1. Number of wash bays:** We have 13 of our 24 maintenance buildings so equipped. Please note this number is for 18 of the 114 counties in the state.
- 2. When used:** Day and night.
- 3. Frequency of use:** Ideally after every winter storm. Trucks will be washed once or twice during the other times of the year.
- 4. Wash bay features:**
 - Indoor.
 - Outdoor.
 - New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Lighted wash bay.
- 5. Length of wash cycle time:** It's all performed by hand, so it varies.
- 6. Description of wash bay operation:** All washing is done manually. A majority of facilities have commercial-type mixing of soap and water. The rest have portable steam cleaners.
- 7. Practices used to manage wash bay wastewater:**
 - Discharge to retention pond.
 - Discharge to sanitary sewer.
 - Oil/water separator.
- 8. Treatment of wash bay wastewater guided by regulations or environmental best practices?** State and/or federal regulation.

Assessing Truck Washing Practices

- 1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 5.
 - Off-site commercial washing facilities:** 5.

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- In-house washing without a wash bay:** 4.
- 2. Successes:**

In-house wash bays: Very handy and employees are much more likely to use them.
 - 3. Challenges:**

In-house wash bays: Getting people to actually wash trucks and/or do effective job of it.

Off-site commercial washing facilities: Facility not allowing us due to concern of salt from winter operations, oil from summer operations; employees having to handle money; getting people to wash trucks and/or do effective job of it.

In-house washing without a wash bay: Ice hazard during winter months; getting people to actually wash trucks and/or do effective job of it.
 - 4. Comments or additional information:** As noted elsewhere, I have answered these questions based upon one of the seven districts in our state. However, there isn't a tremendous amount of variance among the districts.

Nebraska

Contact: Tom Renninger, Assistant Operation and Maintenance Division Manager, Nebraska Department of Roads, 402-479-4787, tom.renninger@nebraska.gov.

- 1. Truck washing practices used:**
 - Use of in-house wash bays.
 - In-house washing without a wash bay.
- 2. Plans to install wash bays?** Yes. We are installing them in all new maintenance facilities as they are being constructed.

Use of In-House Wash Bays

- 1. Number of wash bays:** Approximately 12.
- 2. When used:** Daytime.
- 3. Frequency of use:** After every snow event and periodically during throughout the year during schedule[d] PM [preventive maintenance].
- 4. Wash bay features:**
 - Indoor.
 - Outdoor.
 - New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Pull-on/pull-through wash bay.
 - Lighted wash bay.
- 5. Length of wash cycle time:** Depending on the situation, but for purposes of this survey 30 minutes.

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7. Practices used to manage the wash bay wastewater:

- Discharge to sanitary sewer.
- Oil/water separator.

10. Wash bay costs:

Installation costs: \$150.00 per square foot is what we use for planning purposes.

Assessing Truck Washing Practices

1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):

In-house wash bays: 5.

In-house washing without a wash bay: 4.

2. Successes:

In-house wash bays: Having an in-house wash bay allows the cleaning of equipment year round.

In-house washing without a wash bay: Even though we don't have in-house wash bays in all of our facilities, it [is] still recommended to clean trucks off after a snow event. Weather is a factor with type of practice.

3. Challenges:

In-house wash bays: One wash bay for many trucks; catch basins in the wash bays fill up rather quickly.

In-house washing without a wash bay: Runoff.

New Hampshire

Contact: David Gray, Winter Maintenance Program Specialist, New Hampshire Department of Transportation, 603-419-9017, dgray@dot.state.nh.us.

1. Truck washing practices used:

- In-house washing without a wash bay.

2. Plans to install in-house wash bays? Yes. We are seeking the information on prices right now.

Assessing Truck Washing Practices

1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):

In-house washing without a wash bay: 3.

2. Successes:

In-house washing without a wash bay: It does allow us to get a lot of the salt off of our trucks.

3. Challenges:

In-house washing without a wash bay: It all depends on the weather and spacing between storms if a truck can be washed.

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New Jersey

Contact: Douglas Campbell, Buyer/Winter Operations Coordinator, New Jersey Department of Transportation, 609-530-3786, douglas.campbell@dot.nj.gov.

1. Truck washing practices used:

- Use of in-house wash bays.

Use of In-House Wash Bays

1. **Number of wash bays:** 40.

2. **When used:** Day and night.

3. **Frequency of use:** Once after each event.

4. Wash bay features:

- Indoor.
- Outdoor.
- New construction.
- Retrofit of existing space.
- Permanent wash bay.
- Nonautomated wash bay.

5. **Length of wash cycle time:** Not sure.

6. **Description of wash bay operation:** One fully automated; the remainder are all manual.

7. Practices used to manage wash bay wastewater:

- Discharge to sanitary sewer.
- Filtration.
- Oil/water separator.

8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**
Yes. They are guided by the NJDEP [New Jersey Department of Environmental Protection] guidelines. At minimum, filtration is used at any possible point of discharge to stormwater systems.

Assessing Truck Washing Practices

1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):

In-house wash bays: 5.

In-house washing without a wash bay: 3.

2. Successes:

In-house wash bays: Climate-controlled environment is much more conducive to a more thoroughly washed vehicle.

In-house washing without a wash bay: Minimalistic approach that is intended to remove most of the salt/snow from a vehicle after an event.

3. Challenges:

In-house wash bays: DEP regulations are prohibitive in nature. Cost of repair, reliability

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issues.

In-house washing without a wash bay: Management of wastewater runoff, level of truck cleanliness due to inclement weather.

North Dakota

Contact: Larry Gangl, District Engineer, North Dakota Department of Transportation, 701-227-6510, lgangl@ndsupernet.com.

1. **Truck washing practices used:**
 - In-house washing without a wash bay.
2. **Plans to install in-house wash bays?** Yes, possibly.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**

In-house washing without a wash bay: 5.
2. **Successes:**

In-house washing without a wash bay: It helps a lot to reduce truck corrosion.
3. **Challenges:**

In-house washing without a wash bay: It is difficult to wash our trucks without a designated wash bay. We wash in our garages but it is difficult due to limitations on the amount of room we have. We also have corrosion on the interior of the buildings' structural members due to high humidity.

Ohio

Contact: Scott Lucas, Assistant Administrator, Maintenance Operations, Ohio Department of Transportation, 614-644-6603, scott.lucas@dot.ohio.gov.

1. **Truck washing practices used:**
 - Use of in-house wash bays.
 - Use of off-site commercial washing facilities.
 - In-house washing without a wash bay.
2. **Plans to install wash bays?** Yes. This may take some time if the building is not scheduled to be replaced soon.

Use of In-House Wash Bays

1. **Number of wash bays:** 80 plus.
2. **When used:** Day and night.
3. **Frequency of use:** When needed. During the winter, we try to wash them after a storm. We also perform safety rinses, which entail cleaning the windows, mirrors and lights during a storm.
4. **Wash bay features:**

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- Indoor.
 - New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Pull-on/pull-through wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** It varies [depending] on the person washing the truck and the wash bay.
6. **Description of wash bay operation:** We have many different types of wash bays.
7. **Practices used to manage wash bay wastewater:**
- Discharge to retention pond.
 - Discharge to sanitary sewer.
 - Evaporator system.
 - Filtration.
 - Oil/water separator.
 - Off-site disposal.
 - On-site storage in holding tank.
 - Reuse for brine production.
 - Some of our systems discharge into an area that filters or lets the water settle and then uses the water to make brine.
- (Optional) Other wastewater management practices:** We also let a research project on this very topic. [See Related Resource below.]
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?** Yes, we must run all of the water through an oil/water separator. The water then either goes into a sanitary system, holding tank or lagoon. Water that is to be reused is tested and we seek EPA [U.S. Environmental Protection Agency] approval of our reuse plan before starting the process.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
- In-house wash bays:** 4.
 - Off-site commercial washing facilities:** 4.
 - In-house washing without a wash bay:** 2.
2. **Successes:**
- In-house wash bays:** They perform well.
 - Off-site commercial washing facilities:** They perform well.
 - In-house washing without a wash bay:** They perform poorly but provide some relief.

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3. Challenges:

In-house wash bays: The equipment is too large to allow a person to easily walk around the equipment as they are washing it.

Off-site commercial washing facilities: Cost and traveling off site.

In-house washing without a wash bay: Makes a mess of the garage.

Related Resource:

Snow Removal Wastewater Disposal Alternatives, Christopher M. Miller, William H. Schneider IV, Marla J. Kennedy and Sarah Sullivan, Office of Statewide Planning and Research, Ohio Department of Transportation, January 2014.

http://www.dot.state.oh.us/Divisions/Planning/SPR/Research/reportsandplans/Reports/2014/Environmental/134629_FR.pdf

From the abstract:

Management of truck wash water generated at DOT maintenance facilities without access to sanitary sewer can be costly. Strategies for managing this waste stream, including collection and direct disposal, reuse with and without treatment, and tying into the sanitary sewer were identified and evaluated. The results of truck wash water quality monitoring at 24 maintenance facilities indicated that heavy metals concentrations exceeded the established reuse limits in Ohio at many garages. Pilot scale testing indicated that media filtration and particulate settling may be adequate to reduce heavy metals concentrations to acceptable levels for reuse of wash water.

Oregon

Contact: Shawna Secord, Operations and Policy Analyst, Oregon Department of Transportation, 503-731-8493, shawna.j.secord@odot.state.or.us.

1. Truck washing practices used:

- Use of in-house wash bays.
- In-house washing without a wash bay.

Use of In-House Wash Bays

1. **Number of wash bays:** 40.

2. **When used:** Day and night.

3. **Frequency of use:** Varies by crew.

4. **Wash bay features:**

- Indoor.
- Outdoor.
- Permanent wash bay.
- Nonautomated wash bay.

5. **Length of wash cycle time:** N/A. All washing is manual (e.g., operator with a hose).

7. **Practices used to manage wash bay wastewater:**

- Discharge to retention pond.

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- Discharge to sanitary sewer.
- Discharge to storm sewer.
- Evaporator system.
- Filtration.
- Oil and grease removal.
- Oil/water separator.
- On-site storage in holding tank.
- Reuse for truck washing.

(Optional) Other wastewater management practices: Evaporator includes evaporation from detention pond. Filtration included infiltration.

- 8. Treatment of wash bay wastewater guided by regulations or environmental best practices?**
Both. Discharges that don't go to sanitary sewer may be required to obtain a general permit from the state environmental regulating agency [Oregon Department of Environmental Quality]. However, these permits are not available (expired with no anticipated update provided). Our agency developed and implemented BMPs that match expected update[s] to the regulations.
- 9. Wash bay installation requirements:** Varies by facility, availability of local services, and needs of the crew.
- 10. Wash bay costs:**
 - Installation costs:** \$150,000 for the last one. Lower if not covered or a retrofit.
 - Operating costs:** Depends on use and location. Power, water (if municipal water) and washing supplies.

Assessing Truck Washing Practices

- 2. Successes:**
 - In-house washing without a wash bay:** We have been successful at removing pollutants with vegetation.
- 3. Challenges:**
 - In-house wash bays:** Some smaller municipalities are hesitant to accept water from uncovered bays due to treatment capacity of their systems.

Pennsylvania

Contact: Jon Fleming, Division Chief, Pennsylvania Department of Transportation, 717-772-1771, jonfleming@pa.gov.

- 1. Truck washing practices used:**
 - Use of in-house wash bays.
 - Use of off-site commercial washing facilities.
 - In-house washing without a wash bay.

Use of In-House Wash Bays

- 1. Number of wash bays:** Approximately 55.

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2. **When used:** Day and night.
3. **Frequency of use:** During winter at least once a week. Summer as needed or for each truck PM (PM done four times a year).
4. **Wash bay features:**
 - Indoor.
 - Outdoor.
 - New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Pull-on/pull-through wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** 15 minutes per plow truck.
6. **Description of wash bay operation:** All bays to local sewer or water is recycled. Recently found through testing several bays were not connected to sewer. These bays are being retrofitted or connected to sewer.
7. **Practices used to manage wash bay wastewater:**
 - Discharge to sanitary sewer.
 - Filtration.
 - Oil and grease removal.
 - Oil/water separator.
 - Off-site disposal.
 - Reuse for truck washing.
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?** Yes, see above testing resulting [from] a NPDES/MS4 permitting [National Pollutant Discharge Elimination System/municipal separate storm sewer systems; see <https://www.epa.gov/npdes/stormwater-discharges-municipal-sources#overview>] and Clean Streams regulations [Pennsylvania's Clean Streams Law; see https://pennstatelaw.psu.edu/file/aglaw/Marcellus_Shale/Clean_Streams_Law_Update.pdf].
9. **Wash bay installation requirements:** The majority of our wash bays are located in urbanized areas with sewer and public water. Most of our wash bays are simple setups of an enclosed pressure [washer] with a steam generator and do not have a large need for large volumes of water.
10. **Wash bay costs:**
 - Installation costs:** New turnkey concrete enclosures [with] conventional roof, electric, with steam [j]enny and undercarriage wash. Running \$500,000 to \$1 million.
 - Operating costs:** With a myriad of systems we don't have specific costs.

Use of Off-Site Commercial Washing Facilities

1. **Type of commercial wash bay used:** Conventional truck washes.
2. **Frequency of use:** Only when necessary.

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3. **Cost per truck:** Varies statewide; approximately \$50 per.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**

In-house wash bays: 5.

Off-site commercial washing facilities: 5.

In-house washing without a wash bay: 5.

2. **Successes:**

In-house wash bays: Needed for state inspection (inspecting frame rails). Reduces corrosion from salt on wiring and hydraulic systems. With a 14- to 18-year life span, the cleaned vehicles increase the average life span and increase the value at resale at end-of-life auctions.

Off-site commercial washing facilities: Same as above.

In-house washing without a wash bay: Same as above.

3. **Challenges:**

In-house wash bays: Meeting EPA and local sewer requirements.

Off-site commercial washing facilities: Cost and efficiency of competing with others washing.

In-house washing without a wash bay: Local sewer receiving rain water.

Rhode Island

Contact: Joseph Bucci, Acting Administrator, Rhode Island Department of Transportation, 401-734-4805, joseph.bucci@dot.ri.gov.

1. **Truck washing practices used:**

- In-house washing without a wash bay.

2. **Plans to install in-house wash bays?** Yes. RI has been looking into wash bays for several years. We are very interested in what is available.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**

In-house washing without a wash bay: 2.

2. **Successes:**

Off-site commercial washing facilities: Minor success.

In-house washing without a wash bay: Great for keeping the outside clean, but not effective for engine bay and undercarriage/breaks.

3. **Challenges:**

Off-site commercial washing facilities: Became too costly.

In-house washing without a wash bay: Not very effective preventing corrosion.

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Tennessee

Contact: Ken Hampton, Transportation Manager 1, Tennessee Department of Transportation, 615-741-3458, ken.hampton@tn.gov.

1. **Truck washing practices used:**
 - Use of in-house wash bays.

Use of In-House Wash Bays

1. **Number of wash bays:** 26.
2. **When used:** Day and night.
3. **Frequency of use:** After each winter event and as needed throughout the rest of the year.
4. **Wash bay features:**
 - Indoor.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Pull-on/pull-through wash bay.
 - Lighted wash bay.
 - All wash bays are hand wash and use of power washer.
5. **Length of wash cycle time:** Varies depending on truck size. Minimum time is half hour.
6. **Description of wash bay operation:** All vehicles are rinsed, then we wash from top down, including undercarriage using Rhomar Neutro-Wash [product that neutralizes and then removes white salt residue; see <http://rhomar.com/products/neutro-wash/>]. All chains and gears on v-box spreaders are treated with Lubra-Seal at the end of each winter [also from Rhomar Industries, Lubra-Seal is a proprietary “blend of encapsulating sealants and lubricants” that protects equipment “from rust and corrosion damage caused by moisture, oxygen and salt residue during summer storage,” see <http://rhomar.com/products/lubra-seal/>].
7. **Practices used to manage wash bay wastewater:**
 - Oil/water separator.
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?** Guided by environmental regulations.
9. **Wash bay installation requirements:** All wash bays required the installation of oil/water separators, concrete pad with center drain, a cold water line, portable heat to the building and the use of a steam genie [Steam Jenny; see <http://www.steamjenny.com/>]/power washer.
10. **Wash bay costs:**
 - Installation costs:** \$40,000 per wash bay.
 - Operating costs:** Average annual cost per wash bay is \$3,000.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 4.

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2. Successes:

In-house wash bays: We recently have developed an SOP [standard operating procedure] for our winter maintenance cleanup. The development of the SOP has increase[d] awareness and resulted in increased follow through [for] proper cleaning of vehicles and equipment.

3. Challenges:

In-house wash bays: The greatest challenge is to get statewide compliance in following the cleaning procedures that have been developed. The development of the SOP in conjunction with spot inspections has helped greatly.

4. Comments or additional information:

We have developed SOP for cleaning of dump trucks, brine trailers, v-box spreaders, tailgate spreaders, plows, TowPlows, etc. I would be happy to send a copy of each. [See Related Resource below.]

Related Resource:

Snow and Ice Equipment Cleaning Guidelines, Tennessee Department of Transportation, undated. See [Appendix E](#).

This document provides standard operating procedures for cleaning a v-box material spreader with chain; tailgate material spreader; snowplow; snow truck; TowPlow; and brine trailer.

Utah

Contact: Brandon Klenk, Methods Engineer, Utah Department of Transportation, 801-965-4094, bklenk@utah.gov.

1. Truck washing practices used:

- In-house washing without a wash bay.

2. Plans to install in-house wash bays? Yes. I would like to start installing in-house bays in all the new sheds we build.

Assessing Truck Washing Practices

1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):

In-house washing without a wash bay: 2.

2. Successes:

In-house washing without a wash bay: We are building horseshoe-shaped structures so the guys can wash the entire truck without having to turn it around.

3. Challenges:

In-house washing without a wash bay: It's hard to get employees to wash a truck after a 16-hour shift when it's cold and dark outside.

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Vermont

Contact: Todd Law, Maintenance Engineer, Vermont Agency of Transportation, 802-839-0274, todd.law@vermont.gov.

1. **Truck washing practices used:**
 - In-house washing without a wash bay.
2. **Plans to install in-house wash bays?** No.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**

In-house washing without a wash bay: 2.
2. **Successes:**

In-house washing without a wash bay: We typically hose the trucks off, which reduces some of the residue.
3. **Challenges:**

In-house washing without a wash bay: Getting employees to wash the trucks regularly has been a big challenge. Also, getting them to do a fairly thorough washing with an agent to better eliminate corrosion has also been a struggle.
4. **Comments or additional information:** We are pushing our managers to ensure that a better job is occurring on washing our fleet to reduce corrosion and extend the life of the fleet and reduce the chance of breakdown.

Virginia

Contact: Allen Williams, District Maintenance Engineer, Virginia Department of Transportation, 540-387-5346, allen.williams@vdot.virginia.gov.

1. **Truck washing practices used:**
 - Use of in-house wash bays.
 - Use of off-site commercial washing facilities.
 - In-house washing without a wash bay.
2. **Plans to install wash bays?** Yes. As we construct new area headquarters building[s], the wash bays are a standard part of the design.

Use of In-House Wash Bays

1. **Number of wash bays:** Probably in the range of 150.
2. **When used:** Day and night.
3. **Frequency of use:** Generally after every winter event.
4. **Wash bay features:**
 - Indoor.
 - Outdoor.

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- New construction.
 - Retrofit of existing space.
 - Permanent wash bay.
 - Nonautomated wash bay.
 - Lighted wash bay.
5. **Length of wash cycle time:** All manual.
6. **Description of wash bay operation:** Oil/water separator, grit chamber with water discharged to a pond or sanitary sewer.
7. **Practices used to manage wash bay wastewater:**
- Discharge to retention pond.
 - Discharge to sanitary sewer.
 - Evaporator system.
 - Oil and grease removal.
 - Oil/water separator.
 - On-site storage in holding tank.
 - Reuse for brine production.
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**
Yes, all discharge from washing operations must be treated to remove oil (vehicle fluids), grit and salt, then released to a retention pond or sanitary sewer.
9. **Wash bay installation requirements:** The new wash bays are equipped with lighting, heat, garage doors, drains, grit chamber, oil/water separator and steam/pressure washer. Pressure is set at the washer. Water is commercial, usually a 1 1/2" or 2" line. There are too many variations to list since each site may be different.
10. **Wash bay costs:**
- Installation costs:** Generally constructed as part of a combo building including office, truck storage bays, work bay, storage rooms and wash bay so costs are difficult to break out for just the wash bay.
- Operating costs:** No costs are captured for this activity.

Use of Off-Site Commercial Washing Facilities

1. **Type of commercial wash bay used:** We utilize commercial truck washing facilities at truck stops so they differ greatly depending on location.
2. **Frequency of use:** We ask our operators to wash their trucks after each winter storm, but I do not believe this happens as often as we would like.
3. **Cost per truck:** The washing is purchased by local contracts so the cost varies depending on the truck stop owner. They range from \$12 to \$30 per truck but there are probably some charging more. Do not believe I have heard less than \$12.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**

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In-house wash bays: 4.

Off-site commercial washing facilities: 4.

In-house washing without a wash bay: 3.

2. Successes:

In-house wash bays: The use of salt neutralizer in the pressure washers is a big plus. The ability to control the pressure of the washer is good since we have various pieces of equipment that need various pressures for cleaning.

Off-site commercial washing facilities: Most use truck washes at truck stops, so not having to deal with the disposal of the wash water is a big plus.

In-house washing without a wash bay: Same as the wash bays except colder.

3. Challenges:

In-house wash bays: Dealing with the wash water.

Off-site commercial washing facilities: Inability to add salt neutralizer and standard pressure. Time to drive to the wash site and wait in line with other trucks being washed. A few commercial washers are contracted to come to the areas and contain wash water, but those are very expensive and hard to schedule.

In-house washing without a wash bay: Same as above.

Washington

Contact: James Morin, Maintenance Operations Manager, Washington State Department of Transportation, 360-705-7803, morinj@wsdot.wa.gov.

1. Truck washing practices used:

- Use of in-house wash bays.
- In-house washing without a wash bay.

2. **Plans to install in-house wash bays?** Yes. While we do use in-house wash bays, we expect to continue to expand these particularly in areas with high salt use.

Use of In-House Wash Bays

1. **Number of wash bays:** 8-10.

2. **When used:** Day and night.

3. **Frequency of use:** Typically weekly or when time allows.

4. Wash bay features:

- Indoor.
- Outdoor.
- New construction.
- Retrofit of existing space.
- Permanent wash bay.
- Nonautomated wash bay.
- Lighted wash bay.

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5. **Length of wash cycle time:** We don't have automatic wash bays.....yet.
6. **Description of wash bay operation:** At this point most of our wash water is treated through municipal sewer systems. Two are discharged to evaporation ponds.
7. **Practices used to manage the wash bay wastewater:**
 - Discharge to retention pond.
 - Discharge to sanitary sewer.
 - Discharge to storm sewer.
 - Evaporator system.
 - Oil/water separator.

(Optional) Other wastewater management practices: Evaporator system is simply a lined pond and receives the discharge and evaporates over time. This is in an extremely arid part of the state (6" precipitation annually).
8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?**
No.
9. **Wash bay installation requirements:** We do not have well-thought-out installation requirements, designs or guidelines. We do recognize that we need to move in this direction, however.
10. **Wash bay costs:**

Installation costs: Our latest is a large facility and was in the \$450,000 range. This is a stand-alone building located on a mountain pass with a lot of temperature/snow load issues that drove the cost up substantially.

Operating costs: Unknown. This is not a water-recovery system and is tied into the existing water supply/sewer so we don't have good isolated costs for this facility.

Assessing Truck Washing Practices

1. **Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**

In-house wash bays: 3.

In-house washing without a wash bay: 3.
2. **Successes:**

In-house wash bays: Very limited success. In the one case where we installed a new wash bay we spent two years trying to get the crews to wash equipment on a regular basis. We have made progress and the fleet is showing it. The problem was that the wash bay was installed without local (superintendent) buy-in so it really didn't get used until external pressure was applied.

In-house washing without a wash bay: This works to an extent but obviously has a certain level of impact on the site.
3. **Challenges:**

In-house wash bays: Lack of systematic use. It's difficult to get the crews to prioritize this work with other work that needs to get done. There is not a culture of washing the truck at the end of the shift/week.

In-house washing without a wash bay: This works, but we know we are having a "chronic"-type impact in terms of releasing chlorides into the soil on our sites, or in some cases into stormwater or municipal systems.

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West Virginia

Contact: Edward Goss, Environmental Coordinator, West Virginia Division of Highways, 304-269-8914, edward.l.goss@wv.gov.

1. **Truck washing practices used:**

- Use of in-house wash bays.

Use of In-House Wash Bays

1. **Number of wash bays:** 10 in my area of the state.

2. **When used:** Day and night.

3. **Frequency of use:** It is totally dependent upon the weather; if it's bad, sometimes the trucks go through twice a day.

4. **Wash bay features:**

- Indoor.
- Outdoor.
- New construction.
- Retrofit of existing space.
- Permanent wash bay.
- Lighted wash bay.

5. **Length of wash cycle time:** Time is dependent upon the driver. Trucks are washed with hand sprayers from a heated-water pressure washer.

6. **Description of wash bay operation:** The truck pulls in and the driver gets out to start the washer. He then hand sprays the truck until he thinks it's clean. He then backs out, getting out of the truck again to clean the trench drain, placing the material in a wheelbarrow to be placed back into the SRIC [snow removal and ice control] treatment mix.

7. **Practices used to manage wash bay wastewater:**

- Discharge to sanitary sewer.
- Filtration.
- Oil/water separator.

(Optional) Other wastewater management practices: Depending upon the discharge choice, our wash bays either discharge into the local PSD [public service district] after going through a water/oil (W/O) separator, or if the PSD is not available, then water coming out of the W/O separator is then run through a sand filter with the discharge tested for contaminants twice yearly.

8. **Treatment of wash bay wastewater guided by regulations or environmental best practices?** WV Department of Environmental Protection permits all wash water discharges.

Optional) Additional information about handling of wash bay wastewater. W/O separators are pumped out on an as-needed basis or at least twice yearly by a certified wastewater disposal company.

9. **Wash bay installation requirements:** Obviously the building needs to be big enough for the equipment you have on-site with some room to allow the hand-washing of vehicles. It's nice to have the ceiling high enough to raise the truck beds so they can clean that area also. Since we use motorized pressure washers, line pressure does not really matter to us as long as we have a constant supply, usually from at least a 3/4" water line. All discharges run through a grit trap, a W/O

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separator, then either towards the PSD or through tertiary treatment.

10. Wash bay costs:

Installation costs: Approximately \$30,000.

Operating costs: Unknown.

Assessing Truck Washing Practices

1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):

In-house wash bays: 4.

2. Successes:

In-house wash bays: Provides an easy way to clear the windows and mirrors so the drivers can safely operate during the storm. After the storm they provide a place to really clean and wash off the salt from the material hauled and the spray coming off the roadways.

3. Challenges:

In-house wash bays: Keeping the grit traps cleaned out is probably our biggest challenge. When storm fighting there is a big push to get the trucks back on the road so the drivers don't take the time to clean them out.

4. Comments or additional information: Probably the biggest thing our car washes are used for during fighting snow is keeping the windows and mirrors clean so the drivers can safely operate. After the storm is when the car washes get their most use.

Wisconsin

Contact: Phil Hewitt, Highway Commissioner, Vernon County, 608-637-5452,
phil.hewitt@vernoncounty.org.

1. Truck washing practices used:

- In-house washing without a wash bay.

2. Plans to install in-house wash bays? No.

Assessing Truck Washing Practices

1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):

In-house washing without a wash bay: 2.

2. Successes:

In-house washing without a wash bay: Limited effectiveness.

3. Challenges:

In-house washing without a wash bay: Doing an effective job.

4. Comments or additional information: We are pushing our managers to ensure that a better job is occurring on washing our fleet to reduce corrosion and extend the life of the fleet and reduce the chance of break down.

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Wyoming

Contact: Clifford Spoonemore, Maintenance Staff Engineer, Wyoming Department of Transportation, 307-777-6377, cliff.spoonemore@wyo.gov.

- 1. Truck washing practices used:**
 - Use of in-house wash bays.
- 2. Plans to install in-house wash bays?** No. WYDOT at this time does not plan on installing any new or retrofitting any current wash bays. The current budget has been cut by 8 percent. Also we are hoping this report would generate some washing systems that could be used outside of any structures that may be on a more portable basis. Not a traveling wash system, just one that can be available upon demand and weather conditions.

Use of In-House Wash Bays

- 1. Number of wash bays:** 18.
- 2. When used:** Daytime.
- 3. Frequency of use:** Monthly.
- 4. Wash bay features:**
 - Indoor.
 - New construction.
- 5. Length of wash cycle time:** Done by hand so it depends on the employee. Average 40 minutes.
- 6. Description of wash bay operation:** A place to wash the trucks with a high-pressure wand.
- 7. Practices used to manage wash bay wastewater:**
 - Discharge to leach field.
 - Discharge to sanitary sewer.
- 8. Treatment of wash bay wastewater guided by regulations or environmental best practices?** Self-reporting of testing to WY DEQ [Department of Environmental Quality] Solid Waste Division. Testing for hazardous material levels from our sumps.
- 10. Wash bay costs:**
 - Installation costs:** Unknown.
 - Operating costs:** Unknown and not tracked.

Assessing Truck Washing Practices

- 1. Effectiveness of truck washing practices in preventing or reducing corrosion (1 = not at all effective; 5 = very effective):**
 - In-house wash bays:** 4.
 - In-house washing without a wash bay:** 3.
- 4. Comments or additional information:** I cannot answer #2 and #3 [successes and challenges]. Washing just seems to be a struggle with the operators. During the storm they are out in the event. After the storm they feel like they have to be out and repair the damage caused by crashes. Cleaning tools that do not belong to them is not a real priority, and this may be a supervisor-and-up impression rather than a reality.



Best Practices for ADOT Vehicle and Equipment Wash Facilities

ADOT Guidance Document
6/25/2015

v



REVISION RECORD

Date of Review	Description of Amendments	Initials
6-25-2015	Final Issue	HKH/WT

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Appendix I – Arizona Administrative Code (A.A.C.) R18-9-D303

Appendix II – Best Practices for Vehicle Wash Facilities

Appendix III – Monthly Wash Facility Checklist

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Appendix VI – List of Wash Facilities and contacts

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Appendix VIII – MSDS or SDS for each soap or detergent used at facility

Emergency phone numbers

- **Notify Facilities Maintenance immediately of any of the following:**
 - a. Any leaks, blockages of drains, or other malfunctions with your vehicle wash facility.
 - b. Any announced or unannounced on-site inspections.
 - c. All scheduled pumpouts.

- **Spill – Consult Facility Pollution Prevention Plan (FPPP) Section 4 or call District Environmental Coordinator (DEC)**

Oil-Water Separator (OWS) Malfunction

Contact	Phone
Facilities Maintenance North – James Hartsfield	928-301-2385
Facilities Maintenance Central – David Castro	602-712-7179
Facilities Maintenance South – Pat Terry	520-838-2851
ADOT Groundwater Protection – Kent Haugerud	602-376-8532

Other important phone numbers:

Robert (Trap) Trapani, Equipment Services, 602-712-6177

David Mack, ADOT Industrial Stormwater, 602-376-7935

DEC Contact List:

Flagstaff – Rob Nelson; M. 480-340-4871

Kingman – Julie Alpert; W. 928-681-6042; M. 928-525-4660

Holbrook – Michael Neal; W. 928-524-5468; M. 480-294-0649

Prescott – Chuck Budinger; W. 928-777-5966; M. 928-499-8660

Phoenix – Lisa Anderson; W. 602-361-3227

Globe – Laura Nordan; W. 928-402-5607; M. 928-961-3850

Safford – Tim Levandowski; W. 928-432-4911; M. 928-651-8293

Tucson – Melissa Reuter; W. 520-388-4262

Yuma – Hannah Srogoncik; W. 928-317-2037; M. 928-581-0937

M = Mobile

W = Work

1.0 Introduction

The Arizona Department of Transportation (ADOT) is committed to the development of safe, efficient, and cost effective transportation infrastructure. The construction and maintenance of transportation infrastructure requires a large inventory of vehicles and heavy equipment. This equipment must be cleaned and maintained regularly so it is safe and reliable. The wash water associated with cleaning equipment and vehicles can contain petroleum products (i.e. oil and grease), sediment, detergents, and other potential pollutants. Best practices are necessary to maintain safety and minimize water use, while controlling potential pollutants generated at vehicle wash facilities. Equipment maintenance and good operational practices result in less cost and more efficiency for ADOT.

This manual has been prepared as guidance for ADOT employees who manage and maintain ADOT vehicle wash facilities (wash bays) across the state. It provides best practices regarding operation and maintenance as well as compliance with state and federal regulations concerning discharged wastewater from vehicle wash facilities.

Wash bays have been constructed at many maintenance yards across the state to maintain ADOT vehicles and equipment. Rinsing of snowplows in some areas of Arizona will pose the most intense usage of the wash bays. Other uses include rinsing of haul trucks, Department of Public Safety (DPS), and other State owned vehicles and equipment. ADOT wash bays are designed for exterior wash down only. It is important not to clean vehicle interiors or engine compartments unless the facility is designed for that purpose. Most wash bays are not designed for that purpose. ADOT does maintain a few steam cleaning areas for engine degreasing which can generate a higher concentration of pollutants.

1.1 Safety

1. Confined Space: The oil water separator (OWS) is a confined space and should only be entered by a person qualified in Confined Space Entry.
2. Always wear protective gear: ear, eye, body (feet, face and hands), as necessary to protect against excessive noise, high pressure water, or any other hazard in this work space.
3. Always check the clearance around the truck or equipment to ensure proper freedom of movement while using spray wand.
4. Never point the spray wand toward anyone. It is extremely high pressure and can cause injury.
5. Do not climb on equipment when wet. It can be very slick.
6. Maintain soaps, detergents, and operating tools in the proper place.

Safety reminders

1. Always stay alert.
2. Always use common sense.
3. Always be aware of the dangers of operating this type of equipment.

1.2 Regulations pertaining to Vehicle Wash Facilities

Properly designed vehicle wash facilities discharge dirty wash water to an existing sanitary sewer or a designed on-site disposal system. Local municipalities have requirements for vehicle wash facilities that discharge to regulated sanitary sewer systems. The local sanitary district must be contacted prior to initial discharge from the wash facilities. A local permit or discharge authorization is usually required. Some municipalities also conduct periodic inspections. It is important for the operator to be familiar with local requirements for their wash facility if they discharge to the sanitary sewer.

Wash facilities on State land in Arizona that discharge to an on-site disposal system can be permitted under a general aquifer protection program (APP) permit from the Arizona Department of Environmental Quality (ADEQ). On-site disposal may include discharge to a lined impoundment or leachfield. Prior to discharge, a Notice of Intent (NOI) for a Type 3 general permit, and a Type 3.03 Supplemental NOI for Vehicle and Equipment Washes must be submitted to ADEQ. All wash bays must comply with the requirements of the general permit or an Individual Aquifer Protection Program (APP) permit may be required. The Individual APP is costly and extensive. A copy of the Type 3 general permit is included in the Appendix I (Arizona Administrative Code R18-9-D303).

On tribal lands, either the US Environmental Protection Agency (EPA) or the designated tribal agency has regulatory authority over vehicle wash facilities. The regulating agency in these areas should be contacted prior to construction. On the Navajo Nation, a construction authorization is required prior to construction. After construction an operational permit and operation and maintenance manual is required.

1.3 Pesticide Trucks

All pesticide / herbicide trucks are required to decontaminate prior to leaving the application site. Emptying, rinsing or cleaning of chemical storage tanks or pesticide / herbicide containers is strictly forbidden at all ADOT wash facilities. The wash bays are designed for exterior wash down only. The exterior of pesticide trucks may be washed in the wash bays by registered pesticide / herbicide applicators only. The OWS is not designed to treat pesticides and herbicides.

2.0 Description of the Vehicle Wash Facility



Photo 1: Vehicle wash facility completed 2015

ADOT constructs wash facilities incorporating best practices for efficiency and to avoid comingling of stormwater. All of the structures are covered and some are fully enclosed. All consist of a reinforced concrete wash pad with a cast in place grated trench drain and an elevated catwalk so that rinsing the top of equipment is possible. Through the process of high pressure cleaning some solids (mud, sand, clay, gravel) and oils are generated in the wash water. The wash pad is sloped toward the trench drain with curbing surrounding the wash bay except at the entrance to prevent runoff from the wash facility. The trench drain is connected by a 4-inch pipe to an OWS, which are central for the removal of pollutants in the vehicle wash system. Pre-treated wash water is discharged from the OWS to either an on-site disposal system or municipal sanitary sewer system. Regular maintenance of the components greatly reduces operation and maintenance costs of the system. Best practices are listed in Appendix II (Best Practices for Vehicle Wash Facilities).

3.0 Operation and Maintenance

Regular maintenance activities must be incorporated into daily operation of the wash bay to keep it functioning optimally for everyone. The procedures outlined in this manual will be included in Appendix II, Best Practices for Vehicle Wash Facilities. It is recommended that these be posted at the wash bay so they are common knowledge to all who use the facility. The wash bay should be inspected once per month using the checklist in Appendix III. In addition, the OWS should be inspected once per quarter using the inspection checklist in Appendix IV.

3.1 Pre-Wash

If excess sediment is noted on the wash pad, it should be removed before the equipment is loaded onto the pad. Excess sediment should be removed from the vehicle or equipment prior to washing. The purpose is to ultimately keep sediment out of the OWS, which is not designed for sediment disposal. OWSs will be discussed in more detail later. Vehicle or equipment should be loaded onto the concrete wash pad so that wash water is contained within the wash bay area.

3.2 Vehicle Rinse and Trench Drain

Rinse the equipment using warm or hot water and high pressure to reduce the amount of water required for cleaning¹. Top down rinsing is most effective. A water flow meter installed at each wash bay is beneficial to monitor water usage.

Keeping sediment out of the 4-inch drain pipe is the most effective method to increase the period of time in between costly maintenance of the OWS. The grated trench drain is where sediment collects as vehicles and equipment are rinsed. It is important to keep sediment in the trench drain from flowing into the 4-inch drain pipe which connects to the OWS. Most trench drains are equipped with a baffle or screen to protect the 4-inch drain pipe from sediment. The baffle serves as a weir allowing clean water to flow over the top while preventing sediment from entering the trench drain. If your 4-inch trench drain pipe is not protected by baffle or screen, or if the baffle becomes damaged, please contact the Ground Water Protection Coordinator and arrangements will be made to retrofit your trench.

Phosphate-free biodegradable detergents and soaps are allowed to be used in moderation at ADOT vehicle wash facilities. Soaps and detergents emulsify (break down) oils and reduce the effectiveness of the OWS. To ensure maximum efficiency of the OWS, keep soaps and detergents to a minimum. Maintain the appropriate Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) in Appendix VIII of this manual for each soap or detergent used at the wash facility.

¹ Vehicle and Equipment Wash Water Discharges, Best Management Practices Manual, November 2012, Washington State Department of Ecology, Publication number WQ-R-95-056.



Photo 2: Clean trench as needed to keep sediment out of the trench drain



Photo 3: Trench with sediment removed

Sediment must be removed regularly from the trench so that it does not enter the 4-inch drain pipe. Sediment should be removed from the trench when it reaches a depth of 75% of the baffle height. A square shovel or strong shop vacuum can be used for this purpose. The removed sediment should be placed on the wash pad and dried completely. A contractor or qualified ADOT personnel² should profile collected sediment at a minimum of bi-annually (see Appendix VII). Records should be maintained at the Org that maintains the wash bay and with the Groundwater Protection Coordinator for ten years. If the profile is within landfill disposal requirements, as determined by qualified personnel, the sediment can be disposed of at the landfill, emptied into a dumpster, or mixed with millings. While keeping sediment out of the OWS is of primary importance, it is also important to properly dispose of removed sediment.

² ADOT personnel trained to collect profile samples
Best Practices for ADOT Vehicle and Equipment Wash Facilities

Wash water and sediment from ADOT vehicle wash facilities have been sampled at various points in the process to analyze contaminants (Wash Rack Report Summary, August 22, 2013). Samples were analyzed for metals as well as volatile organic compounds (VOCs). Although the composition of the wash water varied slightly, all sediment samples were within parameters to be disposed at a landfill. A copy of this report is available upon request from the Groundwater Protection Coordinator.

3.3 Oil Water Separator

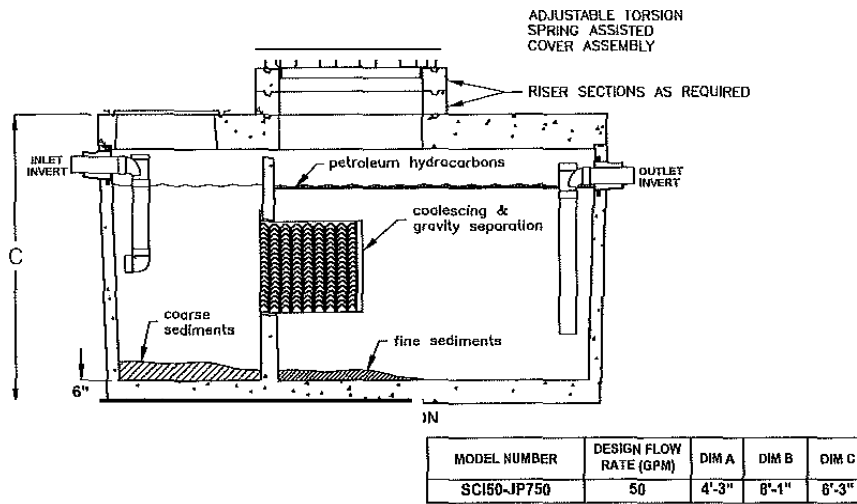


Figure 1: Jensen Precast OWS installed at some ADOT vehicle wash facilities³

The principal treatment component in the wash bay system is the OWS. It is important to have an understanding of how these structures operate in order to maintain the wash bay system. Oil water separators used at ADOT are conventional gravity type separators. The separators have two or three compartments and are equipped with an inlet and outlet “T” that slows the flow of water and allows separation of oil and solids. Some are equipped with polyethylene coalescing plates that help to collect the oil. When properly designed, installed and operated, the OWS provides a treatment system that prevents entry of unacceptable levels of contamination from oily wastewater to a sanitary sewer system or on-site disposal. The OWS is not designed to separate high concentrations of solids or oil from water that might occur when a large quantity of oil or sludge is spilled or poured into a wash bay drain. The OWS is designed to separate and retain oil as it is rinsed or washed from vehicles or equipment. Antifreeze, degreasers, or emulsifying detergents should be prevented from entering the OWS as they will emulsify (break down) the oils.

³ ADOT Truck Wash Station Design Report, Dibble Engineering, 2-7-2014
Best Practices for ADOT Vehicle and Equipment Wash Facilities

The OWS should be inspected once per quarter and recorded on the Quarterly OWS Checklist in Appendix IV. The oil water separator is a confined space and can safely be entered by someone qualified in Confined Space Entry. Oil needs to be removed when there is two inches or more floating on top of any chamber per manufacturer's recommendations. With proper training provided by the Groundwater Protection Coordinator, some oil can be removed from the inlet chamber using absorbent socks. If handled properly, the pads can be wrung out (oil recycled) and reused. Reduced pumping frequency translates to cost savings for the Org.

Sludge is oily dirt that builds up in the bottom of the separator and it is very expensive to dispose. It must be pumped when it accumulates to 8-10 inches in the inlet chamber of the OWS. It is important to use best practices at the wash facility to reduce this sludge buildup. The quantity of sludge found in the inlet section should be used as a basis for determining the next interval before cleaning. If the sludge level is very low, the cleaning interval can be extended. The Groundwater Protection Coordinator will determine the initial cleaning interval. Sludge level can be determined using a length of white PVC pipe as a dip stick in the OWS. The sludge will appear as black soot at the bottom of the PVC pipe.

It is important to note again that the OWS is a confined space and can only be entered by a person trained in Confined Space Entry. Some of the OWS used at ADOT vehicle wash facilities have polyethylene coalescing plates. These plates must be cleaned before they get blinded, or coated with silts and sediment. If sludge has accumulated more than 1/3 up the plate modules of the coalescing plate separators, the interval between cleaning should be shortened per manufacturer's recommendations and the coalescing plates must be cleaned. It is important not to let the sludge accumulate more than 8-10 inches in the inlet chamber. Contact Facilities Management or the Groundwater Protection Coordinator if you believe your coalescing plates have become blinded or sediment has reached approximately 1/3 the height of the plate modules.

Older oils can become emulsified⁴, so regular maintenance is necessary. The ADOT Groundwater Coordinator will complete initial monitoring of the OWS so that a regular service schedule can be developed for each wash bay in accordance with manufacturer's recommendations. After the pumping schedule is established, the on-site contact should schedule pumping the unit through their Facilities Maintenance or the Groundwater Protection Coordinator.

Upon pumping, the amount of oily water and sludge hauled should be recorded in the Pumping Log in Appendix V. The oil water separator will need to be recharged with clean water after pumping. This requires the OWS to be filled with fresh water to the outlet "T" so that oil

⁴ Fact Sheet: The Oil/Water Separator, How to select and maintain an oil/water separator, King County DNR, September 2010

and water will be effectively separated prior to discharge to the sanitary sewer or on-site disposal system.

Bioremediation is a proven method to minimize the oil content in the OWS⁵. Benefits include reduced cleanout frequency, reduced sludge quantities, and reduced or eliminated odors. The process is initiated by adding petroleum eating microbes to the OWS. These microbes break down oil and sludge into water and carbon dioxide. ADOT does not currently have a service contract in place for bioremediation, but this may be explored in the future.

3.4 Required Maintenance Schedule

Weekly	Check sediment in trench and remove if necessary. (See Vehicle Rinse and Trench Drain - Section 3.2)
Monthly	Complete Wash Facility Checklist (Appendix III)
Quarterly	Complete OWS Checklist (Appendix IV)
When OWS is pumped	Fill in Pumping Log (Appendix V)

4.0 Monitoring

If wash water is discharged to an unlined surface impoundment or other area for subsurface disposal on State land, the following monitoring must be conducted on a quarterly basis. Monitoring will be conducted by an ADOT contractor or qualified personnel in accordance with the APP permit. Sampling will be conducted after the OWS and prior to discharge. New wash (2015 or newer) facilities have a distribution box where samples can be collected in order to see if treatment is being performed according to specifications.

1. ADOT will monitor the wash water quarterly at the point of discharge (distribution-box) for pH and for the presence of C10 through C32 hydrocarbons using a Department of Health Services certified method.
2. If pH is not between 6.0 and 9.0, or the concentration of C10 through C32 hydrocarbons exceeds 50 mg/l, ADOT shall submit a report to ADEQ with a proposal for mitigation and shall increase the monitoring frequency to monthly. The report will be compiled in conjunction with the Environmental Planning Group (EPG).
3. If the condition in item 2 above persists for three additional months, ADOT shall submit an application for an individual permit. EPG will work with the District (or Facilities) to prepare and submit the application.

Records must be maintained at the Org operating the wash bay and at the Groundwater Protection Coordinator's office for 10 years.

⁵ Oil/Water Separators, Best Environmental Practices for Auto Repair and Fleet Maintenance, November 1999, USEPA

Vehicle wash facilities that discharge to sanitary sewer systems may have specific pre-treatment requirements. The individual sanitary district must be contacted prior to initial discharge. Generally, a pre-settling trench and OWS are required. These are expected to operate so that contaminants do not enter the sewer system. It is the responsibility of individual users to ensure proper maintenance and operation of the system.

There is currently no discharge monitoring requirements on tribal lands. Navajo Nation EPA requires that all wastewater systems, including vehicle wash facilities, are maintained in accordance with an operation and maintenance plan. The systems are expected to be maintained to treat wastewater to manufacturers' specifications so that contaminants do not discharge from the OWS.

Appendix I

Arizona Administrative Code

A.A.C. R18-9-D303. 3.03 General Permit: Vehicle and Equipment Washes

A. A 3.03 General Permit allows a facility to discharge water from washing vehicle exteriors and vehicle equipment. The 3.03 General Permit does not authorize:

1. Discharge water that typically results from the washing of vehicle engines unless the discharge is to a lined surface impoundment;
2. Direct discharges of sanitary sewage, vehicle lubricating oils, antifreeze, gasoline, paints, varnishes, solvents, pesticides, or fertilizers;
3. Discharges resulting from washing the interior of vessels used to transport fuel products or chemicals, or washing equipment contaminated with fuel products or chemicals; or
4. Discharges resulting from washing the interior of vehicles used to transport mining concentrates that originate from the same mine site, unless the discharge is to a lined surface impoundment.

B. Notice of Intent to Discharge. In addition to the Notice of Intent to Discharge requirements specified in R18-9-A301(B), an applicant shall submit a narrative description of the facility and a design of the disposal system and wash operations.

C. Design, installation, and testing requirements. An applicant shall:

1. Design and construct the wash pad:
 - a. To drain and route wash water to a sump or similar sediment-settling structure and an oil/water separator or a comparable pretreatment technology;
 - b. Of concrete or material chemically compatible with the wash water and its constituents; and
 - c. To support the maximum weight of the vehicle or equipment being washed with an appropriate safety factor;
2. Not use unlined ditches or natural channels to convey wash water;
3. Ensure that a surface impoundment meets the requirements in R18-9-D301(C)(1) through (3). The applicant shall ensure that berms or dikes at the impoundment can withstand wave action erosion and are compacted to a uniform density not less than 95 percent;
4. Ensure that a surface impoundment required for wash water described in subsection (A)(1) meets the design and installation requirements in R18-9-D301(C);
5. If wash water is received by an unlined surface impoundment or engineered subsurface disposal system, the applicant shall:
 - a. Ensure that the annual daily average flow is less than 3000 gallons per day;
 - b. Maintain a minimum horizontal setback of 100 feet between the impoundment or subsurface disposal system and any water supply well;
 - c. Ensure that the bottom of the surface impoundment or subsurface disposal system is at least 50 feet above the static groundwater level and the intervening material does not consist of karstic or fractured bedrock;

- d. Ensure that the wash water receives primary treatment before discharge through, at a minimum, a sump or similar structure for settling sediments or solids and an oil/water separator or a comparable pretreatment technology designed to reduce oil and grease in the wastewater to 15 mg/l or less;
- e. Withdraw the separated oil from the oil/water separator using equipment such as adjustable skimmers, automatic pump-out systems, or level sensing systems to signal manual pump-out; and
- f. If a subsurface disposal system is used, design the system to prevent surfacing of the wash water.

D. Operational requirements. The permittee shall:

1. Inspect the oil/water separator before operation to ensure that there are no leaks and that the oil/water separator is in operable condition;
2. Inspect the entire facility at least quarterly. The inspection shall, at a minimum, consist of a visual examination of the wash pad, the sump or similar structure, the oil/water separator, and all surface impoundments;
3. Visually inspect each surface impoundment at least monthly, to ensure the volume of wash water is maintained within the design capacity and freeboard limitation;
4. Repair damage to the integrity of the wash pad or impoundment liner as soon as practical;
5. Maintain the oil/water separator to achieve the operational performance of the separator;
6. Remove accumulated sediments in all surface impoundments to maintain design capacity; and
7. Use best management practices to minimize the introduction of chemicals not typically associated with the wash operations. Only biodegradable surfactant or soaps are allowed. The permittee shall not use products that contain chemicals in concentrations likely to cause a violation of an Aquifer Water Quality Standard at the applicable point of compliance.

E. Monitoring requirements.

1. If wash water is discharged to an unlined surface impoundment or other area for subsurface disposal, the permittee shall monitor the wash water quarterly at the point of discharge for pH and for the presence of C 10 through C 32 hydrocarbons using a Department of Health Services certified method.
2. If pH is not between 6.0 and 9.0 or the concentration of C 10 through C 32 hydrocarbons exceeds 50 mg/l, the permittee shall, within 30 days of the monitoring, submit a report to the Department with a proposal for mitigation and shall increase monitoring frequency to monthly.
3. If the condition in subsection (E)(2) persists for three consecutive months, the permittee shall submit, within 90 days, an application for an individual permit.

F. Recordkeeping. A permittee shall maintain the following information for at least 10 years and make it available to the Department upon request:

1. Construction drawings and as-built plans, if available;
2. A log book or similar documentation to record inspection results, repair and maintenance activities, monitoring results, and facility closure; and
3. The Material Safety Data Sheets for the chemicals used in the wash operations and any required monitoring results.

G. Closure requirements. A permittee shall comply with the closure requirements specified in R18-9-D301(G) if a liner has been used. If no liner is used the permittee shall remove and appropriately dispose of any liquids and grade the facility to prevent impoundment of water.

Appendix II

ADOT Vehicle Wash Facility Best Practices

1. Safety First
2. Conduct all vehicle and equipment washing in designated wash bays only.
3. Keep the wash pad area clean and free of sediment when not in use to protect the trench drain.
4. Inspect trench weekly to monitor sediment buildup.
5. Remove sediment if it reaches 75% of the baffle depth. (Refer to manual page 6-7 for specific details)
6. When the wash bay is not being used, remove sediment onto the wash pad for drying . Sediment may be mixed with millings or disposed in the trash after drying if initial profile has been completed.
7. Use minimal amounts of phosphate-free biodegradable soaps/detergents.
8. Use soaps/detergents in the contained wash area only.
9. Use pressure washer and warm water to conserve water.
10. Install a flow meter at the wash rack to monitor water usage.
11. No vehicle maintenance is permissible in any wash bay.
12. Direct discharge of oils, fuels, hazardous materials, or hazardous waste onto the wash bay is prohibited.
13. Maintain spill clean-up equipment (absorbents, spill kits, mops, vacuums, etc.) in close proximity to the vehicle wash facilities so that contaminants will not be washed into drain⁶.

⁶ ADOT Equipment Services BMP Manual
Best Practices for ADOT Vehicle and Equipment Wash Facilities

Appendix III

Monthly Wash Facility Checklist



Inspection detail:

1. Inspect the wash pad and note any cracks, damage, or unusual staining.
2. Inspect trench grate and note any damage.
3. Settling trench should be checked every week to ensure sediment has not filled to the top of the baffle which protects the 4-inch drain. No sediment should be in the 4-inch drain pipe. Remove sediment from the settling trench when it reaches 75% of baffle height and allow sediment to dry on the wash pad. Dispose of sediment in accordance with the Vehicle Rinsing and Trench Drain section of the manual.
4. Inspect the distribution box and disposal field. Note any wet or damp areas where water may be surfacing in the disposal field. This may indicate plugged soil substrate. Inspection ports at the end of each disposal field will allow the operator to see if water is coming close to the ground surface.

Monthly Checklist for Vehicle Wash Facility

Location: _____

1. Wash pad condition?
 - a. Cracks? Y ___ N ___
 - b. Damage? Y ___ N ___
 - c. Unusual Staining? Y ___ N ___

2. Trench grate condition?
 - a. Damage? Y ___ N ___

3. Sediment level in trench?
 - a. Sediment filled to 75% of baffle height? Y ___ N ___

4. Distribution box and disposal field condition? (if applicable)
 - a. Excess dampness noted? Y ___ N ___
 - b. Damage to distribution box? Y ___ N ___

Report any damage or deterioration in condition noted above to the Groundwater Protection Coordinator or Facilities Maintenance.

Comments- _____

Inspected by: _____ Date: _____

Appendix IV
Quarterly OWS Checklist

**OIL WATER SEPARATOR
Quarterly
Maintenance Inspection Checklist**

Date of Inspection: _____

Location:

- Car Wash – Oil Water Separator (to on-site disposal)
- Car Wash – Oil Water Separator (to sanitary sewer)
- Steam Clean Service Bay – Oil Water Separator

Inlet Compartment Solids depth _____ Oil layer thickness _____ (Measure using PVC pipe)

Outlet Compartment Solids depth _____ Oil layer thickness _____

If sediment buildup is significant, OWS should be cleaned when (or before) sediment or debris fills 10-inches of the OWS (measured from the bottom of the OWS).

Comments/Visual Observations: (Examples: odors, sheen, leaks, spills, sediment buildup and oil level on surface, signs of deterioration, road film, oil/grease, etc.)

Maintenance / Service Required: (Examples: cleaning, removal of solids, etc)

Inspected by: _____

Appendix V
OWS Pumping Log

Location

Pump Date	Contractor	Quantity sludge	Quantity Oily Water	Recorded by (name)

Appendix VI

Wash Facility Sites and Contacts

Location Name	Contact	Phone
Auction Yard (Rinse down only)	Gary Lowe, Equipment Services (ES)	602-712-7284
Chambers MY	Gilbert Nastacio, Holbrook Maintenance	928—688-2782
Cordes Junction	Randy Skinner, Cordes Junction Const.	928-632-7786
Durango MY	Michael Ripley, Hwy Ops Tech	480-521-3094
Flagstaff MY ES	Kenny Macias, Equipment Shop Super	928-526-0915
Flagstaff MY Maintenance	Thomas Kaufman, Facilities Maintenance	928-779-7541
Fredonia MY	Steven Mackelprang, Fredonia Maint.	928-643-7380
Ganado MY	Ron Curtis, Maintenance Super	928-755-3579
Globe MY	George Collaco, ES Supervisor	928-402-5641
Grant Road MY	Scott Moody, Tucson ES	520-838-2872
Kayenta MY	Kee Kescoli, Kayenta Maint.	928-697-3558
Kingman MY	George Webb, Kingman Maint.	928-681-6029
Little Antelope MY	David Mahler, Lead	928-853-3389
Payson MY	Brett Rupp, Payson Maintenance	928-486-5076
Prescott Valley MY	TJ Sota, Lead	928-642-0589
Quartzite MY	Daniel Zuelsdorf, Quartzite Maint.	928-927-6311
Seligman MY	Tony Mascher, Seligman Hwy Admin	928-422-3482
Springerville MY	Chris Massey, Maintenance Super	928-333-4495
Wickenburg MY	Brent Brinkley, Wickenburg	928-684-2131
Williams MY	Bob Freson, Lead	928-699-2640
Yuma MY	Charles McKinley, ES Supervisor	928-317-2170

Appendix VII

Profile Requirements

Polycyclic Aromatic Hydrocarbons (PAHs) method 8310 & 8270 SIM

Total Volatile Organic Compounds (VOCs) 8260B

Resource Conservation and Recovery Act (RCRA) 8 Metals

Pricing (current per publication) per drum if that is how you will package the waste.

1-4 drums \$70/drum

5-15 drums \$65/drum

>15 drums \$60/drum

If you ship bulk it will be \$42.50 per ton.

AZ tax \$.25 per ton

Profile fee is \$50 one time charge

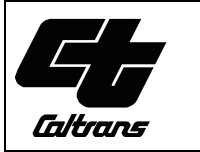
Minimum charge per load is \$160 plus fees

Appendix VIII

MSDS or SDS for each soap or detergent used at wash facility



Name	High-Pressure Washer Room	<i>Category:</i> Appurtenant Building Space
Description	Protection for the high-pressure washer unit and the hoses and supplies associated with its operation of washing vehicles.	
Space Allocation	<i>Standard Allocation:</i>	One per washrack
	<i>Special Justification Required?</i>	No
	<i>Designed for:</i>	N/A
	<i>Related Spaces:</i>	Washrack
Code Information	<i>CBC "Occupancy" Classification:</i>	S-3
	<i>CBC "Occupant Load" Factor:</i>	N/A
	<i>CBC or Title 24 Special Design Requirements:</i>	Consider this space as a "boiler room." If this space is attached to the "B" or "H" occupancy, they must be separated by a one-hour wall;
Mechanical And Electrical Systems	<i>Heating, Ventilation, and Cooling System:</i>	Provide outside air for combustion per California Mechanical Code. Louvered ventilation is adequate.
	<i>Lighting Level:</i>	20fc general illumination @ floor.
	<i>Electrical Power:</i>	One 110v GFCI duplex outlet; bottom of box 3'-6" (1.07 m) above floor. Verify power requirements for equipment.
	<i>Plumbing:</i>	1" (2.54 cm) minimum diameter water supply to cleaner unit. Gas supply to cleaner unit. Flue through roof.
	<i>Telephone:</i>	N/A
	<i>Radio/ Speaker:</i>	N/A
	<i>Telecommunication:</i>	N/A
Special Requirements	<i>Hazards:</i>	Hot equipment, toxic chemicals.
Area and Height Standards	<i>Standard Floor Area:</i>	80 SF (7.4m ²)
	<i>Minimum Ceiling Height:</i>	8'-0" (2.44m)
Materials And Finishes	<i>Floor:</i>	Exposed concrete with sealer.
	<i>Ceiling:</i>	Gypsum wallboard with acrylic enamel paint.
	<i>Wall:</i>	Exposed CMU with seal coat.
	<i>Door:</i>	Pair of 3'-6" (1.07 m) metal doors with louver in PMF.
	<i>Furnishings:</i>	N/A
Remarks	Must be located adjacent to washrack. Washrack must be connected to sanitary sewer or other filtration system. May be freestanding or attached to another building.	



Name	Covered Vehicle Wash Rack/ Mud Rinse	<i>Category:</i> Site Appurtenant Structures
Description	Covered concrete pad and water clarifier system used for washing dirt, oil, and chemicals off vehicles and equipment.	
Space Allocation	<i>Standard Allocation:</i>	One per Maintenance Station, described in PSR document. Tandem rinse slabs may be justified for metropolitan areas
	<i>Special Justification Required?</i>	Yes
	<i>Designed for:</i>	N/A
	<i>Related Spaces:</i>	High-pressure washer room Mudrinse pad for exterior rinse only. Water treatment system, approved by local Water Quality Control Board.
Code Information	<i>CBC "Occupancy" Classification:</i>	S-3 with canopy
	<i>CBC "Occupant Load" Factor:</i>	N/A
	<i>CBC or Title 24 Special Design Requirements:</i>	None noted
Mechanical And Electrical Systems	<i>Heating, Ventilation, and Cooling System:</i>	N/A
	<i>Lighting Level:</i>	10fc general illumination @ ground
	<i>Electrical Power:</i>	One 110v, GFCI, weatherproof duplex outlet.
	<i>Plumbing:</i>	Waste water treatment system.
	<i>Telephone:</i>	N/A
	<i>Radio/ Speaker:</i>	N/A
	<i>Telecommunication:</i>	N/A
Special Requirements	<i>Hazards:</i>	Pressurized hot water and cleaning chemicals.
	<i>Water Treatment:</i>	All rinse/wash water must pass through the water treatment system before being discharged into the sewer or water recycle system.
Area and Height Standards	<i>Standard Floor Area:</i>	37'x47' (11.28 m x 14.33 m) for mudrinse and washrack
	<i>Ceiling Clearance Height:</i>	20'-0" (6.1 m) ceiling. 18'-0" (5.5 m) portal height.
Materials And Finishes	<i>Floor:</i>	Exposed concrete with surface hardener and sealer.
	<i>Ceiling Clearance Height:</i>	N/A
	<i>Wall:</i>	None
	<i>Door:</i>	N/A
	<i>Furnishings:</i>	N/A
Remarks	Slope pad to drain to sump. Elevate slabs and slope surrounding grade away from pads to prevent stormwater from entering water treatment system. Locate the water treatment system within 10'-0" (3.05 m) of wash slab. Subsequent guidelines published by Headquarters or Water Quality Control Boards will supersede the above requirements	

Snow and Ice Equipment Cleaning Guidelines

DANGER!

Serious personal injury or DEATH can result from being caught in an operating conveyor, spinner or other moving equipment. Before performing any maintenance operations, park the vehicle on level ground, set parking brake and USE EXTREME CAUTION and all necessary personal protective equipment

The following guidelines should be followed at the end of the season to prepare equipment for summer storage.

Maintenance Procedure: V-Box Material Spreader with Chain

1. Prior to washing the spreader, back vehicle into the proper material storage area, turn spinner to the off position and run the conveyor to ensure all material is unloaded from the hopper.
2. Drain any remaining liquid from pre-wet storage tanks and return any unused product to the proper storage tanks.
3. Move vehicle and v-box spreader to the wash bay. Make sure spinner is in the off position, turn the conveyor on and while the conveyor is running, thoroughly wash the hopper and conveyor chain using approved soap.
4. After the V-box is cleaned use a salt neutralizing agent (Neutro-Wash or equivalent) following all instructions of that product.
5. Remove strainer screen from fluid line, clean screen and replace element.
6. Remove cap from pre wet outlet system and flush pre wet pump with fresh, clean water making sure that the pump runs long enough to clear any pre-wet fluid residue from the system.
7. Following the fresh water rinse flush with R.V. antifreeze. The fluid will protect the system against any un-anticipated cold weather events, and also lubricate the water pump.
8. Check and grease all zerk fittings on the V-box assembly, check fluid level in conveyor motor gearbox.
9. Remove hold down straps from spreader, and inspect straps and binders looking for any wear or damage. All straps are to be stored inside to promote longevity.
10. Disconnect hydraulic hoses. Make a visual inspection of unit looking for any damage, loose fasteners, abnormal wear in any moving parts, hydraulic leaks from hoses, fittings or hydraulic motors. Hydraulic hose fittings are to be dipped in lubricant (Lubra-Seal or equivalent) to ensure complete protection of the fitting.

Snow and Ice Equipment Cleaning Guidelines

Fittings on truck are to be coated with the same lubricant. Rubber plugs/caps are to be installed on all hydraulic fittings.

11. Remove the spreader from the dump body secure legs on the stand. Look under the conveyor chain and remove any material that may be left on the chain. Wash the underside of the spreader.
12. Following the washing procedure, lubricate the main chain by spraying a lubricant (Lubra-Seal or equivalent) on both sides of the chain and sprockets. This procedure shall be performed while the conveyor is running to ensure that the entire chain is completely coated on both sides.
13. Check and grease all zerk fittings and moveable parts on the V-box spreader stand. Store v-box in designated area.
14. Provide your supervisor with a list of any needed repairs, or problems found upon the inspection of the spreader.

Snow and Ice Equipment Cleaning Guidelines

Maintenance Procedure: Tailgate Material Spreader

1. Prior to washing the spreader, back vehicle into the proper material storage area, turn spinner to the off position and run the auger to ensure all material is unloaded from bed and spreader trough.
2. Move vehicle and spreader to the wash bay. Make sure spinner is in the off position. Turn the auger on and while the auger is running, thoroughly wash the auger and the entire spreader assembly with approved soap.
3. After spreader assembly is cleaned use a salt neutralizing agent (Nuetro-Wash or equivalent) following all instructions of that product.
4. Grease any bearings on spreader and check the fluid level in the auger motor gear box.
5. Inspect the spreader assembly to include spinner and hydraulic hoses for any damage, excessive wear, loose fasteners or leaks.
6. Following the washing procedure, lubricate the auger and inside of trough area by spraying with lubricant (Lubra-Seal or equivalent). This procedure shall be performed while the auger is running to ensure that the entire auger is completely coated.
7. Disconnect hydraulic hoses, remove spreader from truck and store in appropriate location. Hydraulic hose fittings are to be dipped in lubricant (Lubra-Seal or equivalent) to ensure complete protection of the fitting. Fittings on truck are to be coated with the same lubricant. Rubber plugs/caps are to be installed on all hydraulic fittings.

Snow and Ice Equipment Cleaning Guidelines

Maintenance Procedure: Snow Plow

1. Move vehicle to wash bay and thoroughly wash complete snowplow assembly with approved soap.
2. After plow assembly is cleaned use a salt neutralizing agent (Nuetro-Wash or equivalent) following all instructions of that product.
3. Begin by checking the lift chain for cracks or stretching. Inspect the chain attaching points at the push frame and be sure that the attaching shackle bolts are secure.
4. Inspect all pins on the plow, push frame and vehicle mounted plow hitch. Inspect for possible missing retainer clips and missing or damaged pins. Inspect push frame for damage.
5. Inspect power reversing hydraulic hoses, fittings and cylinders for leaks or damage.
6. Inspect the cutting edge for wear or damage, inspect for missing or loose, cutting edge mounting bolts.
7. Grease all appropriate grease fittings as needed on the plow assembly.
8. Inspect lift cylinder, hoses and fittings for leaks or damage.
9. Start the vehicle and operate the plow checking for proper operation.
10. Report any damage or issues to your supervisor.
11. Disconnect hydraulic hoses, remove plow from truck and store in appropriate location. Hydraulic hose fittings are to be dipped in lubricant (Lubra-Seal or equivalent) to ensure complete protection of the fitting. Fittings on truck are to be coated with the same lubricant. Rubber plugs/caps are to be installed on all hydraulic fittings.

Snow and Ice Equipment Cleaning Guidelines

Maintenance Procedure: Snow Truck

1. Move vehicle to wash bay. Using only approved soap, wash the entire outside of vehicle, this is to include the cab, tires and wheels, inside and outside of bed. Raise the bed and install the appropriate bed props to hold the bed in the raised position. Wash the underside of bed and the frame at this point.
2. Open the doors and wash the door jambs and sills and clean any salt residue from floor mat.
3. After the truck is clean, use a salt neutralizing agent (Neutro-Wash or equivalent) following all instructions of that product. Neutralizing agent should be applied to all truck surfaces.
4. Perform a complete vehicle walk around, inspecting all items on the vehicle.
5. Lift the body to its fully raised position, install the appropriate bed props and check the cylinder and all hydraulic hoses for leaks or damage. Inspect all brake lines, hoses and electrical wiring to be sure that all are secure and there are no leaks or damage. Re-coat truck hydraulic fittings as needed with lubricant (Lubra-Seal or equivalent). Rubber plugs/caps are to be installed on all hydraulic fittings.
6. Grease all fittings on the body and hoist as needed.
7. Remove the bed props and lower the body.
8. Check the hydraulic fluid level and add as needed.
9. Report all damage, leaks, or abnormal wear of any parts to your supervisor.

Snow and Ice Equipment Cleaning Guidelines

Maintenance Procedure: Tow Plow

1. Prior to washing the tow plow, back tow plow into the proper material storage area, turn spinner to the off position and run the conveyor to ensure all material is unloaded from the hopper.
2. Drain any remaining liquid from pre-wet storage tanks and return any unused product to the proper storage tanks.
3. Move vehicle and tow plow to the wash bay. Make sure spinner is in the off position, turn the conveyor on and while the conveyor is running, thoroughly wash the hopper and conveyor chain using approved soap. Turn conveyor off and thoroughly wash entire tow plow assembly.
4. After the tow plow is cleaned use a salt neutralizing agent (Neutro-Wash or equivalent) following all instructions of that product. Use neutralizing agent on all surfaces of the tow plow.
5. Remove strainer screen from fluid line, clean screen and replace element.
6. Remove cap from pre wet outlet system and flush pre wet pump with fresh, clean water making sure that the pump runs long enough to clear any pre-wet fluid residue from the system.
7. Following the fresh water rinse flush with R.V. antifreeze. The fluid will protect the system against any un-anticipated cold weather events, and also lubricate the water pump.
8. Check and grease all zerk fittings on the tow plow assembly, check fluid level in conveyor motor gearbox.
9. Make a visual inspection of unit looking for any damage, loose fasteners, abnormal wear in any moving parts, hydraulic leaks from hoses, fittings, cylinders and hydraulic motors. Check all chains for stretching and cracking. Check chain mounting points for wear or loose fasteners. Inspect all pins and pin retainers. Inspect cutting edge for wear or damage, inspect for missing or loose cutting edge mounting bolts.
10. Following the washing procedure, lubricate the main chain by spraying a lubricant (Lubra-Seal or equivalent) on both sides of the chain and sprockets. This procedure shall be performed while the conveyor is running to ensure that the entire chain is completely coated on both sides.
12. Disconnect hydraulic hoses. Hydraulic hose fittings are to be dipped in lubricant (Lubra-Seal or equivalent) to ensure complete protection of the fitting. Fittings on

Snow and Ice Equipment Cleaning Guidelines

truck are to be coated with the same lubricant. Rubber plugs/caps are to be installed on all hydraulic fittings.

11. Provide your supervisor with a list of any needed repairs, or problems found upon the inspection of the tow plow.

Snow and Ice Equipment Cleaning Guidelines

Maintenance Procedure: Brine Trailer

1. Drain any remaining liquid from tank and return unused product to the proper storage tanks.
2. Move brine trailer to the wash bay and wash the trailer making sure that all surfaces are thoroughly cleaned.
3. After the trailer is cleaned use a salt neutralizing agent (Neutro-Wash or equivalent) following all instructions of that product.
4. Remove manway cover and camlock bottom discharge from tank and flush with fresh, clean water making sure that the entire tank is thoroughly rinsed and that all residue is removed from the tank.
5. Following the fresh water rinse flush with R.V. antifreeze. The fluid will protect the system against any un-anticipated cold weather events.
6. Conduct a complete visual inspection of trailer and brine unit looking for any damage and abnormal wear. Inspect the drip bar, nozzles, fittings and hoses checking for leaks and damage. Inspect tank tie downs.
7. Provide your supervisor with a list of any needed repairs, or problems found upon the inspection of the spreader.



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