

Petroleum Storage and Handling

WHY BE CONCERNED?

Liquid petroleum products are concentrated, effective sources of power, lubrication, and heat. Aboveground and underground storage of petroleum products such as transportation fuel and heating fuel, however, can be a threat to family and farm safety, public health, and the environment. The U.S. Environmental Protection Agency (EPA) estimates that 25 percent of underground storage tanks are leaking. The potential for leakage increases dramatically for underground tanks more than 20 years old. Improperly installed tanks that may leak are another serious cause for concern. Even small leaks of one drop per second will release 400 gallons of fuel into the environment annually. Used liquid petroleum products, such as lubricating oils and hydraulic fluids, also can be sources of contamination if they are not collected, stored, and disposed of safely.

Proper installation, operation, and monitoring of petroleum storage tanks is essential because any lost gasoline, diesel fuel, or fuel oil can move rapidly through soil into groundwater. Petroleum fuels contain a number of potentially toxic compounds, including common solvents such as benzene, toluene, and xylene, and additives such as ethylene dibromide (EDB) and organic lead compounds. EDB is a carcinogen (cancer causer) in laboratory animals, and benzene is considered a human carcinogen. Vapors from underground leaks that collect in basements, sumps, and other underground facilities have the potential to ignite. Preventing leaks and avoiding spills are important methods of keeping potential pollutants from contaminating groundwater and surface water. Even low levels, undetectable by taste or smell, of fuel contaminants in water may affect human health.

Not following safety procedures around storage facilities can lead to accidents and can put stored, flammable liquid petroleum products at risk during any response to an emergency.

Safe storage and handling of liquid petroleum products can be very involved technically and subject to a range of regulations, especially if the amount stored is greater than 1,100 gallons and

if any commercial use is made of the stored products. Reliable sources of highly specialized information, both technical and regulatory, may be difficult to locate, but will be invaluable in avoiding future problems when large quantities are stored.

The goal of Pennsylvania Farm•A•Syst is to help you protect groundwater and surface water, shared resources which are important to everyone.

HOW TO RANK GROUNDWATER AND SURFACE WATER PROTECTION USING THIS WORKSHEET

- You can select from a wide range of petroleum storage conditions and management practices that are related to groundwater and surface water contamination.
- You can rank your petroleum storage conditions and management practices according to how they might affect groundwater and surface water.
- Based on your overall ratings, you can determine which of your conditions or practices are reasonably safe and effective, and which might require modification to better protect groundwater and surface water.

HOW TO COMPLETE THE WORKSHEET

Follow the directions on the next page. The evaluation should take 15 to 30 minutes to complete and to determine your ranking. Evaluate each petroleum product storage tank that is part of the farmstead. Spaces are provided to rank up to three tanks on your farmstead. If you have more than three tanks, please use another worksheet. If you are unfamiliar with any of the terms used or regulations mentioned, refer to the glossary provided with this worksheet.

Information derived from Farm•A•Syst worksheets is intended only to provide general information and recommendations to farmers regarding their own farmstead practices. It is not the intent of this educational program to keep records of individual results; however, they may be shared with others who will help you develop a resource management plan.

WORKSHEET # 7: PETROLEUM PRODUCT STORAGE AND HANDLING

Use a pencil, in case you want to change an answer later. For each feature listed on the left that is appropriate for your farmstead, read across to the right and circle the statement that most closely describes conditions on your farmstead. Leave blank any features that don't apply to your farmstead. Find the corresponding "rank number" (4, 3, 2, 1) for each description you circled and enter that number in the blank under "RANK."

If the conditions in any one description do not match your situation exactly, use an in-between score of one-half unit; for example, 2.5 or 3.5. Directions for overall scoring appear at the end of the worksheet. Allow 15-30 minutes to complete the worksheet and to determine the level of groundwater and surface water protection you are providing.

MANAGEMENT OF SITE CONDITIONS

| | 4 Best | 3 Good | 2 Fair | 1 Poor | RANK (up to 3 tanks) |
|--|--|--|--|--|--|
| LOCATION (all tanks) | | | | | Tank Identification #1 #2 #3 |
| 1. Soil drainage characteristics and water table or flooding | Well-drained soils, not subject to flooding. Water table beneath tank. | Moderately well-drained soils, not subject to flooding. Only occasional high water table (water table between 1.5 and 3 ft from land surface). | Somewhat poorly drained soils, not subject to flooding (water table between 0.75 and 1.5 ft from land surface) | Poorly or very poorly drained soils (water table <0.75 ft from land surface) or subject to flooding. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 2. Slope of land between tank and well | Tank downslope from well. | Tank at grade from well with slow-permeability soils. | Tank at grade from well with rapid-permeability soils. | Tank upslope from well. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 3. Separation distance between tank and well or surface water | Tank is more than 500 feet from well or surface water. | Tank is 150 to 500 feet from well or surface water. | Tank is 50 to 150 feet from well or surface water. | Tank is less than 50 feet from well or surface water. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| Tank Identification #1. _____ #2. _____ #3. _____ | | | | | |

| | | | | | Tank Identification #1 #2 #3 |
|--|---|---|---|--|--|
| DESIGN AND INSTALLATION (all tanks) | | | | | |
| 4. Tank installation^a | Installed by certified technician. ^b | Installed according to manufacturer's recommendations provided by seller of new tank. | No information on installation. | Installed without backfill, setback, secondary containment, anchors, and other protections, and by untrained individual. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 5. Spill and tank overflow protection | Impermeable catch basin plus automatic shutoff. | Impermeable catch basin plus overflow alarm. | Impermeable catch basin or concrete catch pad. No overflow alarm. | No protection or overflow alarm | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 6. Piping | Sloped back toward tank with check valve at the pump. | — | Slope toward tank uncertain. Check valve at tank. | Does not drain freely back to tank. All pressure systems. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |

^a Tank installations must conform to the requirements of Pennsylvania Code Title 37 and must be permitted by the State Fire Marshal.

^b PA Department of Environmental Protection, Bureau of Watershed Conservation, Division of Storage Tanks

| | 4 Best | 3 Good | 2 Fair | 1 Poor | RANK (up to 3 tanks) |
|--|---|---|---|---|--|
| DESIGN AND INSTALLATION (below-ground tanks only) | | | | | Tank Identification #1 #2 #3 |
| 7. Type and age of tank/corrosion protection | Double-walled synthetic or double-walled steel tank protected from corrosion by corrosion-resistant coating or cathodic protection. | Single-walled synthetic, fiberglass-clad, or interior-lined steel tank, less than 15 years old. | Asphalt-coated or unprotected steel tank less than 15 years old. | Asphalt-coated or unprotected steel tank more than 15 years old. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 8. Piping | Double-walled fiberglass or steel piping that is cathodically protected. Isolated from the tank. | Fiberglass or steel protected from corrosion. Isolated from the tank. | Galvanized or bare steel less than 15 years old. Not isolated from tank and of similar materials. | Galvanized or bare steel more than 15 years old. Not isolated. Piping and tank of dissimilar materials. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| DESIGN AND INSTALLATION (above-ground tanks only) | | | | | Tank Identification #1 #2 #3 |
| 9. Tank location | Located more than 40 ft from buildings. | — | Located more than 25 ft, but less than 40 ft from buildings. | Located less than 25 ft from buildings. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 10. Tank support | Tank on floor flanges or metal feet with concrete anchors at least 6 inches above soil surface or on concrete pad. | Support legs in good condition on secure foundation. Protected from falling snow or ice. | Support legs in good condition, but foundation cracked or weakened. Subject to falling snow or ice. | Support legs rusted or weakened. Subject to falling snow or ice. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 11. Tank enclosure | Tank surrounded by well-ventilated, noncombustible building or 6-ft-tall fence with lock. Firewall between tank and fuel dispensing area. | Tank surrounded by low fence with lock. Firewall in place. | Tank surrounded by low fence. No lock. No firewall. | No enclosure. Located in high-traffic area. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 12. Secondary containment | Tank placed within concrete dike with pad able to hold 125% of tank contents. | Tank placed inside dike with pad made of slow-permeability soil and able to hold up to 125% of tank capacity. | Tank placed on pad only with no containment. | No pad. No containment. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| MONITORING (all tanks) | | | | | Tank Identification #1 #2 #3 |
| 13. Tank and pipe integrity testing and leak-detection monitoring^a | Continuous interstitial monitoring of double-walled tank system. | Frequent inspection and annual tank tightness testing. | Occasional inspection and tank tightness testing every 5 years. | No inspection and testing. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |
| 14. Inventory monitoring | Daily inventory control and monthly reconciliation. | Weekly inventory control. | Monthly inventory control. | No inventory control. | <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> |

^a If capacity exceeds 1,100 gallons for transportation fuels, lubricating oils, and hydraulic fluids, the tanks are regulated by Pennsylvania Legislative Code Act 32.

| | | | | |
|-----------|-----------|-----------|-----------|-------------------------|
| 4 Best | 3 Good | 2 Fair | 1 Poor | RANK (up to 3 tanks) |
|-----------|-----------|-----------|-----------|-------------------------|

| TANK CLOSURE (underground tanks) | | | | | Tank Identification | | |
|----------------------------------|--|--|--|--|--------------------------|--------------------------|--------------------------|
| | | | | | #1 | #2 | #3 |
| 15. Unused tank | Tank cleaned and removed ^a from ground by certified technician. ^b Excavation checked for contamination via sampling and laboratory analysis. | Tank cleaned and samples taken. Area under tank checked for contamination. Tank filled with sand. Work done by certified technician. | Tank emptied, removed, or filled with inflammable materials. Excavation not checked for contamination. | Tank left in ground empty or containing product. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

^a Tank removals must comply with sections 13.221 to 13.226 of Pennsylvania Code Title 37.

^b PA Department of Environmental Protection, Bureau of Watershed Conservation, Division of Storage Tanks

| SAFETY (all tanks) | | | | | Tank Identification | | |
|---|---|---|--|--|--------------------------|--------------------------|--------------------------|
| | | | | | #1 | #2 | #3 |
| 16. Fueling procedures—fire safety | Engines always off and cool. No smoking. | — | Engines usually off and cool. No smoking. | Engines allowed to run. Smoking occurs. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 17. Fueling procedures—spills | Filling always monitored. Overfill protection such as automatic nozzle shutoff installed and working. | — | Filling seldom monitored or overfill protection installed and working. | Filling not monitored or overfill protection not installed or not working. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 18. Fueling procedures—container filling | Approved containers always used for transport. | — | Approved containers usually used for transport. | Unapproved containers used for transport. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 19. Fire extinguisher | A 10-lb ABC fire extinguisher is within 50 ft of fuel tank. | — | A 10-lb ABC fire extinguisher is greater than 50 ft from fuel tank. | No fire extinguisher available. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

| USED OIL AND FLUIDS | | | | | Tank Identification | | |
|---|--|---|---|--|--------------------------|--------------------------|--------------------------|
| | | | | | #1 | #2 | #3 |
| 20. Disposal of used engine oil and other petroleum fluids | Stored in sealed, approved container in a secure building until taken to a collection or recycling center. | Stored in nonapproved container in an unsecured building and taken to a collection or recycling center. | Disposed of with household waste by a collection service or at a county dump. | Drained on the ground or dumped on the farm. | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

Number of Features Ranked
(Number of questions answered) _____

TOTAL
Use this total to calculate overall performance ranking.

HOW TO USE THESE RANKINGS

Step 1: Now that each feature has been ranked, add all the rankings together for each tank and put that value in the "Total" box at the end of the worksheet. Transfer that number to the first space in the box below.

Step 2: Divide the total by the number of features ranked to obtain the average ranking for that tank.

| | | | | |
|---|------------|------------------------|--------|--------------------|
| _____ | divided by | _____ | equals | _____ |
| (total of rankings) | | (# of features ranked) | | (average ranking)* |
| *carry your answer out to one decimal place | | | | |

Step 3: Repeat for the remaining tanks. Calculate the average ranking for all tanks combined.

Step 4: Evaluate the overall management practices and tank conditions.

3.6-4.0 = best management

2.6-3.5 = good management

1.6-2.5 = fair management

1.0-1.5 = poor management

This ranking gives an idea of how petroleum product storage and handling as a whole might affect water quality. This ranking should serve only as a very general guide, not a precise diagnosis. Since it represents an averaging of many rankings, it can mask any individual rankings (such as 1's and 2's) that should be of concern.

Step 5: Look over the rankings for individual features of each tank:

Best (4's): the current ideal

Good (3's): provides reasonable groundwater protection

Fair (2's): inadequate protection in many circumstances

Poor (1's): poses a high risk of polluting groundwater

Regardless of the overall ranking, any individual rankings of "1" should receive immediate attention. Some problems can be taken care of right away; others could be major or costly projects, requiring planning and prioritizing before action is taken.

Step 6: Consider how to modify farmstead management practices or tank conditions to better protect water quality. Contact your petroleum products supplier, the local conservation district, your Cooperative Extension office, or the USDA Natural Resources Conservation Service for ideas, suggestions, or guidance. The Storage Tank Program at the regional Department of Environmental Protection office (1-800-42-TANKS or <http://www.dep.state.pa.us>) has a complete set of helpful factsheets describing inventory control, farm storage tank requirements, and the various certification programs for storage tank installation and removal. Finally, the API (American Petroleum Institute, 1200 L St., NW, Washington, DC 20005, (202) 682-8000) is a source for the most up-to-date information on national standards.

GLOSSARY

Cathodic protection: A technique to prevent corrosion of a metal surface by reversing the electrical current between metals or between metals and their surroundings that causes corrosion. A tank can be protected by sacrificial anodes or impressed current. Sacrificial anodes are pieces of metal attached directly to an underground tank or piping that are more electrically active than the steel. Because the anodes are more active, current runs from them, rather than the steel, and they are consumed or “sacrificed” in the process. Protection by impressed current involves creating an electrical flow from a series of electrodes placed in the ground around the tank and piping. This current is greater than the corrosive current from the steel, so the metal is preserved.

Certified technician: A person certified by the state to install and repair petroleum storage tanks (UMX category for installation and modification, and UMR category for removal—Department of Environmental Protection, Bureau of Watershed Conservation, Division of Storage Tanks). See Factsheet #2 from the Department of Environmental Protection, Bureau of Watershed Conservation, Division of Storage Tanks (1-800-42-TANKS) for details.

Corrosion: Deterioration of a metallic material (“rust”) due to a reaction of the metal with its environment. Damage to tanks is caused when a metal underground tank and its underground surroundings act like a battery. Part of the tank becomes negatively charged, and another part positively charged. Moisture in the soil provides the connecting link that finally turns these tank “batteries” on. When the current starts to flow, the negatively charged part of the underground tank system where the current exits from the tank or piping begins to soften, and holes begin to form, causing leaks.

Galvanized: The result of coating iron or steel with zinc. Galvanized materials do not meet corrosion protection requirements for underground applications.

Interstitial monitoring: Checking for released petroleum product in the space between the two walls of a double-walled tank system. Continuous monitoring is done by sensors that are actively checking for the presence of released product in that space at all times. The functioning of these sensors needs to be checked once per month. Periodic monitoring often relies on a manual check of the space for released product with a dip stick at least once per month.

Inventory control: Measuring and comparing the volume of tank contents regularly against product delivery and withdrawal to detect leaks before major problems occur. See Factsheet #11 from the Pennsylvania Department of Environmental Protection, Bureau of Watershed Conservation, Division of Storage Tanks (1-800-42-TANKS) for details.

Pennsylvania Code Act 32: Pennsylvania legislative act providing for the regulation of storage tanks and tank facilities

(Storage Tank and Spill Prevention Act, P. L. 169, No. 32, 1989). Copies are available from the Pennsylvania Department of Environmental Protection, Bureau of Watershed Conservation, Division of Storage Tanks, Harrisburg, PA (1-800-42-TANKS) or from any Department of Environmental Protection regional office. Generally applies to farm tanks of greater than 1,100 gallons capacity.

Pennsylvania Code Title 37: Pennsylvania legislative act defining and providing for the handling and storage of flammable and combustible liquids, including the prevention of petroleum storage tank fires and explosions (P. L. 450, No. 29, April 27, 1927). Chapters 11 and 13 are available in the *Flammable and Combustible Liquids Handbook*, revised 1984, Commonwealth of Pennsylvania, Harrisburg, PA. Enforcement of Title 37 (Chapters 11 and 13) is the responsibility of the Pennsylvania State Police Fire Marshal. Generally applies to tanks with capacities greater than 30 gallons that are used for materials other than home heating fuel oil.

Secondary containment: A system such as a sealed basin and dike that can catch and hold the contents of a tank (usually at least 125% of capacity) if it leaks or ruptures.

Soil drainage: Describes the extent, frequency, and duration of wet soil periods when free water is present close to the land surface.

Soil permeability: The characteristic describing the speed at which water or air moves in the soil. Fine-textured materials like clays permit only slow water or air movement through small pores between the particles. Coarse-textured materials like sands permit rapid water and air movement through large pores between the particles. Soil structure and cracking can increase the movement of water or air through soil by changing the distribution of pore sizes.

Spill and overfill protection: Spill protection usually consists of a catch basin for collecting fluids that escape when the tank is filled. Overfill protection is a device warning of or preventing an overfill, such as an automatic shutoff or buzzer. These precautions can prevent groundwater pollution from a number of small releases over a very long period of time.

Tank tightness testing: A procedure for testing the resistance of a tank to releasing any stored substance into the environment, or to intrusion of groundwater into an underground tank. A certified underground storage tank-tank tightness tester with UTT approval (Underground Storage Tank Tightness, Pennsylvania Department of Environmental Protection, Bureau of Watershed Conservation, Division of Storage Tanks) should be used for underground storage tightness testing. **Note:** A UTT-certified technician is required for regulated underground storage tanks, and recommended for all underground storage tightness testing. See Factsheets #12 and #13 from the Department of Environmental Protection, Division of Storage Tanks (1-800-42-TANKS) for details.

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The Pennsylvania Farm•A•Syst package contains the following Worksheets:

- Introduction
- Farmstead Map
- Preliminary Screening Quiz
- Worksheet #1 - Water Well Condition and Construction
- Worksheet #2 - Pesticide and Fertilizer Storage and Handling
- Worksheet #3 - Household Wastewater Treatment System
- Worksheet #4 - Barnyard Conditions and Management
- Worksheet #5 - Milkhouse Waste Management
- Worksheet #6 - Stream and Drainageway Management
- Worksheet #7 - Petroleum Storage and Handling
- Overall Farmstead Ranking

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