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WORKSHEET 6

Nebraska's System for Assessing Water Contamination Risks

Petroleum Product Storage

Why should I be concerned?

Aboveground and underground storage of liquid petroleum products such as motor fuel and heating fuel presents a threat to public health and the environment. Nearly one out of every four underground storage tanks in the United States may now be leaking, according to the U.S. Environmental Protection Agency. If an underground petroleum tank is more than 20 years old, especially if it's not protected against corrosion, the potential for leaking increases dramatically. Newer tanks and piping can leak, too, especially if they were improperly installed.

A small gasoline leak of only one drop per second can result in the release of about 400 gallons of gasoline into the groundwater in one year. Even a few quarts of gasoline in the groundwater may be enough to severely pollute your drinking water. At low levels of contamination, petroleum product contaminants in water cannot be detected by smell or taste, yet the seemingly pure water may be contaminated to the point of affecting human health.

Preventing tank spills and leaks is especially important because of how rapidly gasoline, diesel, and fuel oil can move through surface layers and into groundwater. Also, vapors from an underground leak that accumulate in basements, sumps, or other underground structures have the potential to explode. Selling property with an old underground tank may also be difficult because of future owner liability.

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.

This worksheet focuses on storage of gasoline, diesel fuel, kerosene, and liquid heating fuels. It does not apply to LP (liquid propane) gas, since leaks vaporize quickly and do not threaten groundwater.

The goal of Farm*A*Syst is to help you protect the groundwater that supplies your drinking water.

How will this worksheet help me protect my groundwater?

- It will take you step-by-step through your petroleum product storage practices. It will evaluate your activities according to how they might affect the groundwater that provides your drinking water supplies.
- It will provide you with easy-to-understand "risk level scores" that will help you analyze the relative safety of your petroleum product storage practices.
- It will help you determine which of your practices are reasonably safe and effective, and which practices might require modification to better protect your drinking water.

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Elbert C. Dickey, Interim Director of Cooperative Extension, University of Nebraska, Institute of Agriculture and Natural Resources.

How do I complete the worksheet?

Follow the directions at the top of the chart on the next page. It should take you 15 to 30 minutes to complete this worksheet and determine your risk level.

Information derived from Farm*A*Syst worksheets is intended only to provide general information and recommendations regarding your practices. It is not the intent of this educational program to collect records of individual results.

Glossary

These terms may help you make more accurate assessments when completing *Worksheet 6.* They may also help clarify some terms used in *Fact Sheet 6.*

Cathodic protection: A technique to prevent corrosion of a metal surface by reversing the electric current that causes corrosion. A tank system can be protected by sacrificial anodes or impressed current. (See sacrificial anodes and impressed current.)

Certified installer: A person certified by the State Fire Marshal to install and repair underground petroleum storage tanks.

Corrosion: Deterioration of a metallic material (example: "rust") due to a reaction with its environment. Damage to tanks by corrosion is caused when a metal underground tank and its underground surroundings act like a battery. Part of the tank can become negatively charged, and another part positively charged. Moisture in the soil provides the connection that finally turns these tank "batteries" on. Then, the negatively charged part of the underground tank system—where the current exits from the tank or its piping—begins to deteriorate. As electric current passes through this part, the hard metal begins to turn into soft ore, holes form, and leaks begin.

Corrosion protection: One method of corrosion protection is cathodic protection. Steel tanks can be protected by coating them with a corrosion-resistant coating combined with "cathodic" protection. Steel underground tanks can also be protected from corrosion if they are bonded to a thick layer of noncorrosive material, such as fiberglass-reinforced plastic. Also, the corrosion problem can be entirely avoided by using tanks and piping made completely of noncorrosive material, such as fiberglass.

Galvanized: The result of coating an iron or steel structure with zinc. Note that galvanized materials do not meet corrosion protection requirements.

Impressed current: A corrosion protection system that introduces an electric current into the ground through a series of anodes that are not attached to the underground tank. Because the electric current flowing from these anodes to the tank system is greater than the corrosive current attempting to flow from it, the underground tank is protected from corrosion.

Interior liner: An applied lining or coating for petroleum storage tanks made of noncorrosive synthetic materials such as epoxy type resins that can protect the interior of metal tanks effectively.

Inventory control: Measuring and comparing the volume of tank contents regularly with product delivery and withdrawal records to help detect leaks before major problems develop.

Sacrificial anodes: Pieces of metal attached directly to an underground tank that are more electrically active than the steel tank. Because the anodes are more active, electric current runs from the anodes rather than from the tank. The tank becomes the cathode (positive electrode) and is protected from corrosion. The attached anode (negative electrode) is "sacrificed" or consumed in the corrosion process. Sacrificial anodes have a life of about 30 years, but must be tested periodically to ensure effectiveness.

Secondary containment: A system such as a sealed basin and dike that will catch and hold the contents of a tank if leaks or ruptures occur.

Soil permeability: The property that enables soil to transmit water or air. Soils with low permeability are fine-textured materials like clays that permit only slow water movement. Moderately or highly permeable soils are coarse-textured materials like sands that permit rapid water movement.

Spill and overfill protection: Spill protection usually consists of a catch basin for collecting spills when the tank is filled. Overfill protection is a warning or prevention of an overfill, such as an automatic shutoff, buzzer, ball float in the tank vent line, or specially constructed drop tube installed in the fill pipe. These precautions can prevent a number of small releases over a very long period of time from polluting the groundwater.

Tank closure: A legal term whereby a permit is obtained from the State Fire marshal, a fuel tank is removed from a site (or filled in-situ with inert material such as soil), the surrounding soil is sampled for evidence of contamination, and notice is given to the State Fire Marshal of the detailed procedures carried out. Tanks over 1,100 gallons capacity must be closed by a certified individual, while tanks under 1,100 gallons capacity may be closed without a permit and by a non-certified individual on his/her own property.

Tank tightness testing: A procedure used for testing integrity of a tank or a testing procedure to determine if a tank is currently leaking. **Note:** Using air to pressurize a tank that has contained petroleum is **not allowed.** This is an extremely dangerous procedure.

Petroleum Product Storage: Assessing the Risk of Surface Water and Groundwater Contamination

1. Use a pencil. You may want to make changes.
2. For each category listed on the left that is appropriate to your situation, read across to the right and circle the statement that best describes practices on your propertpy. (Skip and leave blank any categories that don't apply.)
3. Then look above the description you circled to find your "risk number" (4, 3, 2, or 1) and enter that number in the blank under "YOUR RISK."
4. Allow 15-30 minutes to complete the worksheet and figure out your risk for petroleum product storage practices.

	HIGH RISK (risk 4)	HIGH-MODERATE RISK (risk 3)	MODERATE-LOW RISK (risk 2)	LOW RISK (risk 1)	YOUR RISK
LOCATION (all tanks)					
Position of tank in relation to drinking water well and soil types	Tank at grade or upslope ***less than 100 feet from well*** in coarse-textured soil (sand, sandy loams) with high permeability.*	Tank downslope more than 100 feet from well in coarse-textured soil (sands, sandy loam) with high permeability.*	Tank at grade or upslope more than 100 feet from well in medium- or fine-textured soils (silt loam, loam, clay loams, silty clay) with low permeability.*	Tank downslope more than 100 feet from well in medium- or fine-textured soils (silt loam, loam, clay loams, silty clay) with low permeability.*	
DESIGN AND INSTALLATION (for underground tanks)					
Type and age of tank / corrosion protection	Bare steel tank 15 or more years old.	Coated steel tank 15 or more years old OR bare steel tank less than 15 years old.	Steel tank less than 15 years old, coated with paint or asphalt.	Synthetic tank or tank protected from rust by cathodic protection.	
Tank corrosion potential	Located in area with fine-textured soils (clay loams, silty clay) often saturated.	Located in area with medium- or fine-textured soils (silt loams, loam, clay loams, silty clay) saturated seasonally.	Located in area with moderately well-drained soils, only occasionally saturated.	Located in area with well-drained soils, rarely saturated.	
Spill and tank overfill protection	No protection.	Impermeable catch basin or concrete catch pad.	Impermeable catch basin plus overfill alarm.	Impermeable catch basin plus automatic shutoff.	
Piping network	Piping and tank isolated and of dissimilar materials. Non-isolated bare pipe, cannot drain freely to the tank. All pressure pipe systems.	Pipe galvanized, not isolated or bare. Piping sloped back to tank, but check valve is located at tank (foot valve).	Piping galvanized but not isolated from tank. Pipe drains back to tank. Check valve at pump.	Piping protected from rust by cathodic protection and isolated from tank, sloped back to tank. Check valve at pump (not at tank).	

Bold Italic type: Besides representing a higher risk choice, this practice also violates Nebraska law for new construction. Existing wells must meet separation requirements in effect at the time of construction.

* Low permeability soils, like clay, allow water to flow through slowly. High permeability soils, like sand and gravel, allow much faster water movement.

	HIGH RISK (risk 4)	HIGH-MODERATE RISK (risk 3)	MODERATE-LOW RISK (risk 2)	LOW RISK (risk 1)	YOUR RISK
DESIGN AND INSTALLATION (for underground tanks) (continued)					
Tank installation	Installed without backfill, setback, secondary containment, anchors and other protection, or by untrained individuals.	No information on installation.	Installed according to recommendations provided with new tank by seller.	Installed by state-certified installer.	
DESIGN AND INSTALLATION (for aboveground tanks)					
Tank design	Steel tank in contact with ground, or non-steel container. Siphon or internal pressure system.	Steel tank less than minimum gauge, combustible support frame.	Steel tank of 12 gauge thickness, combustible support frame.	Steel tank of 12 gauge thickness, noncombustible support frame.	
Spill and tank overfill protection	Common vent and no overfill protection. No nozzle leak or dispenser system protection.	Separate vent and fill opening. No overfill protection, no anti-siphon, no self-closing nozzle. Unsecure dispensing system.	Separate vent and fill opening. No overfill protection or anti-siphon or self-closing nozzle. Lockable dispensing system.	Separate vent and fill opening. Overfill protection and anti-siphon or self-closing nozzle. Dispensing system locked.	
Tank installation	Installed without leak protection, or by untrained individuals.	No information on installation.	Installed according to recommendations provided with new tank by seller.	Installed by state-certified installer.	
Tank enclosure	No enclosure.	Tank surrounded by low fence. No lock.	Tank surrounded by low fence with lock.	Tank surrounded by 6-foot tall non-combustible building or fence with lock. Building should be well ventilated.	
Secondary containment	No secondary containment.	Tank placed on pad.	Tank placed within dike and pad made of low permeability soils*, able to hold 125% of tank capacity.	Tank placed within concrete or synthetic dike with pad able to hold 125% of tank capacity.	

* Low permeability soils, like clay, allow water to flow through slowly. High permeability soils, like sand and gravel, allow much faster water movement.

	HIGH RISK (risk 4)	HIGH-MODERATE RISK (risk 3)	MODERATE-LOW RISK (risk 2)	LOW RISK (risk 1)	YOUR RISK
MONITORING (for all tanks)					
Tank integrity testing and leak detection monitoring	No inventory control, testing, or monitoring of tank or piping.	Occasional inventory control and annual tank tightness testing (for underground tanks) and occasional pipe testing.	Daily inventory control and annual tank tightness testing (for underground tanks) and annual pipe testing.	Regular (monthly) leak monitoring.	
TANK CLOSURE (for underground tanks)					
Unused tank	Tank not removed nor filled with inert material ***(1,100 gallons or larger tank illegal after 12 months)***	Tank removed or filled with inert material. Excavation not sampled for contamination.*	Tank filled with inert material and excavation sampled for evidence of leaking.	Tank removed. Excavation sampled for evidence of contamination.	

Bold Italic type: Besides representing a higher risk choice, this practice also violates Nebraska law.
*Tank removal without sampling for contamination may violate some regulatory codes.

Your groundwater vulnerability score from *Worksheet 2* was _____
Note: If the surface texture, subsurface texture, or depth to groundwater used to calculate this score are not characteristic of the site conditions present for the activities / practices discussed in this worksheet, calculate a new vulnerability score for this site.

If your groundwater vulnerability score is:
- 1 to 1.4: your site has a LOW VULNERABILITY to pollution reaching groundwater.
- 1.5 to 2.4: your site has a MODERATE-LOW VULNERABILITY to pollution reaching groundwater.
- 2.5 to 3.4: your site has a HIGH-MODERATE VULNERABILITY to pollution reaching groundwater.
- 3.5 to 4.0: your site has a HIGH VULNERABILITY to pollution reaching groundwater.

Your surface water vulnerability score from *Worksheet 2* was _____
Note: If the surface texture, slope toward surface water, or distance from surface water used to calculate this score are not characteristic of the site conditions present for the activities / practices discussed in this worksheet, calculate a new vulnerability score for this site.

If your surface water vulnerability score is:
- 1 to 1.4: your site has a LOW VULNERABILITY to pollution reaching surface water.
- 1.5 to 2.4: your site has a MODERATE-LOW VULNERABILITY to pollution reaching surface water.
- 2.5 to 3.4: your site has a HIGH-MODERATE VULNERABILITY to pollution reaching surface water.
- 3.5 to 4.0: your site has a HIGH VULNERABILITY to pollution reaching surface water.

Look over your worksheet scores for individual activities:

- **Low risk** practices (1's): are ideal and should be your goal regardless of your site's vulnerability to pollution reaching ground or surface water. Cost and other factors may make it difficult to achieve a low risk rating for all activities.

- **Moderate-low risk** practices (2's): provide reasonable water quality protection unless your site's vulnerability to pollution reaching ground or surface water is moderate-high or high.

- **High-moderate risk** practices (3's): do not provide adequate protection in many circumstances, especially if your site's vulnerability to pollution reaching ground or surface water is high or high-moderate. They may provide reasonable water quality protection if your site's vulnerability to pollution reaching ground or surface water is low to moderate-low.

- **High risk** practices (4's): pose a serious danger of polluting water, especially if your site's vulnerability to pollution reaching ground or surface water is high, high-moderate, or moderate-low. Some high risk activities may not immediately threaten water quality if your site's vulnerability to pollution reaching ground or surface water is low, but still pose a threat over time if not corrected.

Read ***Fact Sheet 6 Improving Petroleum Product Storage*** and consider how you might modify your practices to better protect your drinking water supply and other ground and surface water supplies. Some concerns you can take care of right away; others could be major or costly projects requiring planning and prioritizing before you take action.

Summary Evaluation for Petroleum Product Storage Worksheet

Summarize your potential high risk activities in the following table and consider the response options you can take to reduce the potential for water quality contamination.

High Risk Activities and Activities Impacted by Site Vulnerability	**Response Options (Check One)**		**Taking Action** For "immediate action possible" items, note practices and when each will occur. For issues "requiring further planning," note estimates, consultations, or other activities necessary and when each will occur. Establish a target date for making necessary changes.
	Immediate Action Possible	**Further Planning Required**	

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