Source Water Delineation and Assessment Report

Public Water Supply: Lubrecht Experimental Forest
(PWSID #MT0000867)

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Introduction & Purpose

Bethany Haines, an intern with the Montana Department of Environmental Quality (DEQ) Source Water Protection Section completed the Lubrecht Experimental Forest Source Water Delineation and Assessment Report (SWDAR), with review and assistance from Joe Meek. This report is intended to satisfy the requirements of the Montana Source Water Protection Program (DEQ, 1999) and the Federal Safe Drinking Water Act amendments of 1996.

The primary purpose of this source water delineation and assessment report is to provide information that helps the PWS protect its drinking water source. The Montana Source Water Protection Program is intended to be a practical and cost-effective approach to protect public drinking water supplies from contamination. Information for this report came from DEQ files and the Montana state library's online GIS database (http://nris.state.mt.us).

Public Water Supply Information

Lubrecht Experimental Forest is located by Highway 200 at the top of Greenough Hill 30 miles northeast of Missoula, Montana in the Blackfoot River drainage (Figure 1). The water system consists of one well that serves water to two homes, one research center, one lodge that has 16 rooms, one duplex, one bathhouse, one dining hall, one machine shop and two caretakers cabins. The Lubrecht Experimental Forest water supply serves a transient population of about 30 people daily, a non-transient non-residential population of four people daily, and a residential population of three people daily through ten active service connections. Because the facility does not regularly serve the same 25 persons for at least six months a year, it is classified as a transient, non-community public water supply (TNCWS). Water demand is approximately 1,950 gallons per day, assuming water use is 35 gallons per day per transient user, 50 gallons per non-transient non-residential user, and 100 gallons per day per resident user (EPA, 1991).

The well log (GWIC #67718) indicates that well was drilled in 1989 to a depth of 60 feet below ground surface with a six-inch casing that extends to 35 feet below ground surface and five-inch casing from 41 feet to 61 feet below ground surface. The static water level was 11 feet below ground surface with a pumping water level of 13.5 feet below ground surface (Appendix B). The depth of the well and the lithology of the well suggest the aquifer is semi-confined, it is treated as unconfined for the puropose of this report and is assigned a high sensitivity rating to potential contaminant sources in the area, in accordance with the Source Water Protection Guidance document (MT DEQ, 1999).

As a transient non-community PWS, the system samples only for coliform bacteria and nitrate plus nitrite as nitrogen. The system had a tested positive for coliform bacteria in May 2001. A

health advisory was issued and later removed with five consecutive satisfactory samples. The PWS reportedly experienced a broken water line that allowed shallow ground water to contaminant the system resulting in several positive coliform samples. Nitrate was reported at 0.22 mg/L in January 2006, below the EPA MCL for nitrate which is 10 mg/L.

Delineation

For a transient PWS, source water protection areas are delineated: the control zone and the inventory region. The control zone overlies the zone of immediate contribution to the well. Ideally, all sources of potential contaminants are excluded from this area. The inventory region represents the area expected to provide water to the well over a longer period.

Methods and criteria for delineating these areas are specified in the Montana Source Water Protection Program (DEQ, 1999). The control zone is the area within a 100-foot radius of the wellhead. For a transient PWS tapping an unconfined aquifer, the inventory region is the area within a one-mile radius modified to exclude area down-gradient. Delineated source water protection areas are shown on Figure 2.

Inventory

Since the Lubrecht Experimental Forest is a TNC PWS, the inventory is limited to potential sources of nitrate and coliform bacteria. Land use information was used to inventory potential contaminants sources in the control zones and inventory region. A susceptibility assessment is completed for any potential contaminant sources that the DEQ's Source Water Protection Section considers to be significant (as established in the Source Water Protection Program document (1999)).

The well is located outside of the well house near the picnic pavilion. Generally, the control zone should be isolated from traffic, parking, and other potential contaminants. Drainage away from the wellhead should also be maintained.

The location of the wastewater collection and treatment systems are located as shown on the site map included in the appendices of this report. The systems operator has noted that the main camp septic system which was designed and installed by a professional engineering firm consists of septic tanks, collection tanks, a pumping station, and elevated sand mound drainfields (due to the heavy clay soils in the area). The septic lines, tanks, and drainfields are a potential source of contamination if a break or leak were to occur. There is a utility pole located within the control zone. Utility poles are treated to minimize rot and separation distance to the well should be maintained to limit the potential of leaching of treatment materials near the well bore.

There is a remediation response site at Lubrecht Forest where gasoline was spilled in 1995. Eighteen yards of contaminated soil were removed and the site was closed. There are also underground storage tanks (USTs) and Highway 200 located in the inventory region, however, these are not considered to be significant to this class of PWS and PWS susceptibility to it is not assessed.

Susceptibility Assessment

The on-site septic systems are considered potential sources of contaminants, and presents a high hazard to the PWS source water.

Table 1: Significant Potential Contaminant Sources

Source	Contaminant	Hazard Rating	Barriers	Susceptibility	Recommended Management Options
Large Capacity Septic system	Nitrates, Pathogens	***High***	Clay layer overlying aquifer Advanced septic treatment system	***Moderate***	Encourage proper operation and maintenance of on-site septic tank, drainfield and distribution lines (Fact sheet in Appendix D).

LIMITATIONS

This Source Water Delineation and Assessment Report is intended to meet the technical requirements for delineation and assessment as required by the Montana Source Water Protection Program (DEQ, 1999) and the federal Safe Drinking Water Act (SDWA) Amendments of 1996 [U.S. Code Title 42, Chapter 6A, Subchapter XII, Part E, § 300j-13-(a) Source Water Assessment]. The following limitations should be noted:

- Not every source of contamination to the PWS well has been identified. Consideration was limited to potential sources of contamination within the inventory region. Additionally, sources of contaminants that are not regulated for a transient PWS (*i.e*. petroleum hydrocarbons) were not inventoried or assessed.
- No site inspection was performed, and the inventory was developed from available sources of information, including DEQ files and NRIS.
- The potential contaminant sources described in the inventory are identified from readily available information. Consequently, unregulated activities or unreported contaminant releases may have been overlooked. The inventory is not exhaustive.
- Some management recommendations are fairly site-specific and can be implemented by the public water supply. However, other management options can only be implemented by federal, state, county or local governmental entities. When the latter options are mentioned, it is not implied or suggested that this public water supply should lead or spearhead the effort to implement the management option. It is assumed that representatives from this public water supply would participate in the public process sponsored by various governmental entities to develop and implement any of these management options.

References:

Montana Bureau of Mines and Geology, 2005. Ground Water Information Center (GWIC), lithologic well logs. http://mbmggwic.mtech.edu/

Montana Department of Environmental Quality Public Water Supply Section, 2005. Safe Drinking Water Information System (SDWIS).

Montana DEQ, 1999. Montana Source Water Protection Program, Approved by EPA in November 1999.

Montana DEQ, 2000. Montana Source Water Protection Program, Template for Non-Community Transient Public Water Supplies, Revised 2002.

Montana DEQ Permitting and Compliance Division, 2001. Sanitary Survey for Lubrecht Experimental Forest, Inc. PWS- PWS ID: #MT0000867.

Montana Natural Resources Information Interactive Map website. 2005. http://nris.state.mt.us/interactive.html

Montana State Library - Natural Resources Information System (NRIS) 2000 map base of the USGS Topographical coverage at 1:24,000 scale in MrSID format.

Safe Drinking Water Act (SDWA) Amendments of 1996 [U.S. Code Title 42, Chapter 6A, Subchapter XII, Part E, § 300j-13-(a) Source Water Assessment].

United States Environmental Protection Agency, 1991. Manual of Small Public Water Supply Systems. EPA 570/9/919003, 211 p.

U.S. Geological Survey, 2000. National Landcover Dataset, Montana. 30-meter electronic digital landcover/land use dataset interpreted from satellite imagery.

Various Authors, 2000-2005. Correspondence in DEQ's PWS files regarding the Lubrecht Experimental Forest Water Supply.

APPENDIX A: Figures

Appendix B: Well Log

Montana Bureau of Mines and Geology
Ground-Water Information Center Site Report
LUBRECHT EXPERIMENTAL FOREST

Location Information

GWIC Id:	67718	Source of Data:	LOG
Location (TRS):	13N 15W 12 CCBB	Latitude (dd):	46.8927
County (MT):	MISSOULA	Longitude (dd):	-113.4495
DNRC Water Right:	C070421-00	Geomethod:	MAP
PWS Id:	00867002	Datum:	NAD27
Block:		Altitude (feet):	4110.00
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	60.00	How Drilled:	FORWARD ROTARY
Static Water Level (ft):	11.00	Driller's Name:	CAMP
Pumping Water Level (ft):	13.50	Driller License:	WWC007
Yield (gpm):	97.00	Completion Date (m/d/y):	3/3/1989
Test Type:	PUMP	Special Conditions:	
Test Duration:	7.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	120SICL
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:	6 INCH STEEL CASING SUBMERSIBLE PUMP BOLT ON CAP		

Hole Diameter Information

From	To	Diameter
0.0	60.0	6.0

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-2.0	35.0	6.0				19 LB STEEL
41.0	61.0	5.0				9.6 LB PVC

Annular Seal Information

From	To	Description
0.0	20.0	CEMENT

Completion Information[1]

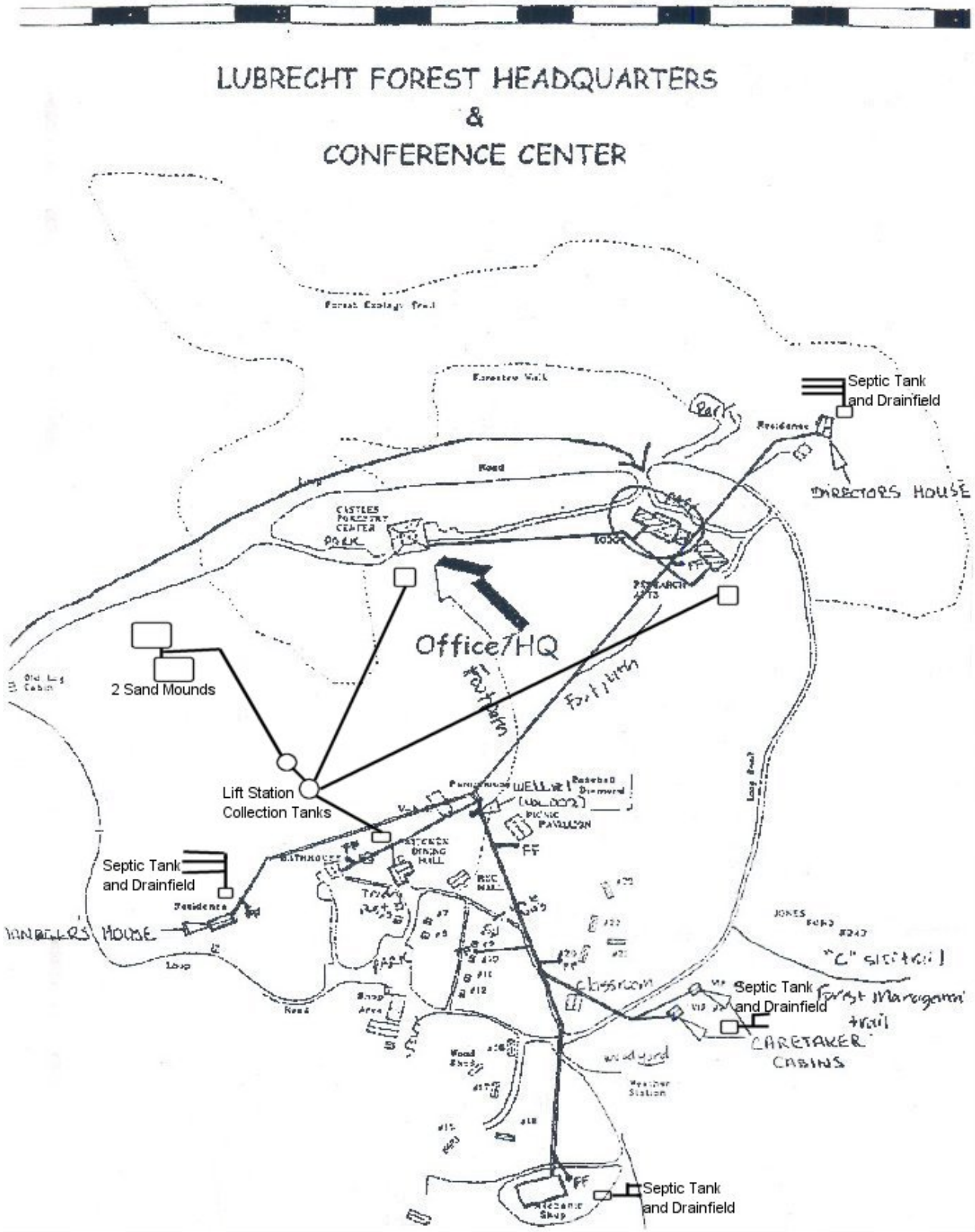
From	To	Dia	# of Openings	Size of Openings	Description
35.0	41.0	5.0		0.020	SCREEN

Lithology Information

From	To	Description
0.0	5.0	BLACK DIRT & CLAY
5.0	12.0	WET CLAY
12.0	20.0	CLAY SHALE & WATER
20.0	41.0	SHALE & WATER
41.0	60.0	CLAY & SHALE

[1] - All diameters reported are **inside** diameter of the casing.

Appendix C: Sitemap



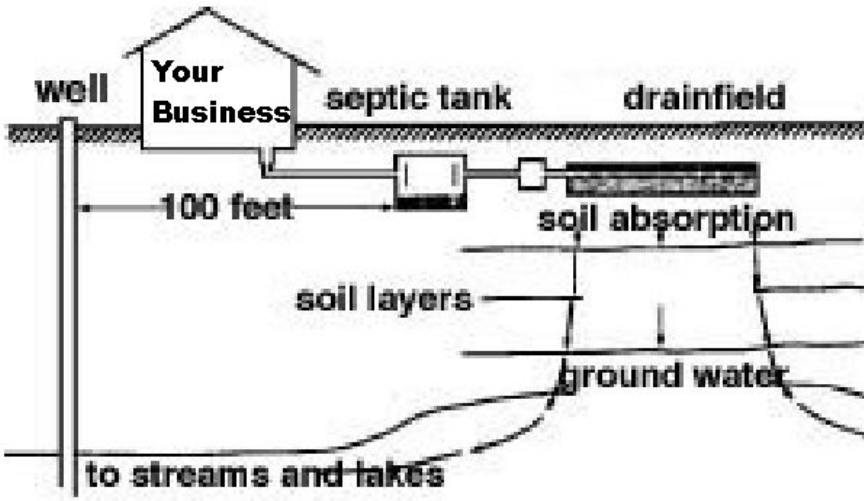
Appendix D:

Large Septic Capacity System Operation and Maintenance

Fact Sheet

FACT SHEET SWP-105 **September 2003**

Basic information on proper operation and maintenance of residential scale septic systems is available through various sources in the state (see Resources near the end of this publication). For some commercial establishments, the sources and characteristics of wastewater may be quite similar to those of residential wastewater. For other businesses and institutions, however, wastewater may be very different: for example, it may contain harsh industrial-strength cleaners or high concentrations of oils, or it may derive from processes (e.g., small-scale manufacturing) that introduce chemicals and other substances not found in residential wastewater. Accordingly, many large capacity septic system owners face a couple of special considerations in operating and maintaining their systems. If improperly used or operated, septic systems can be a significant source of ground water contamination that can lead to waterborne disease outbreaks and other adverse health effects. This fact sheet is provided to address some of those considerations and to help owners of large capacity septic systems protect their source of drinking water.



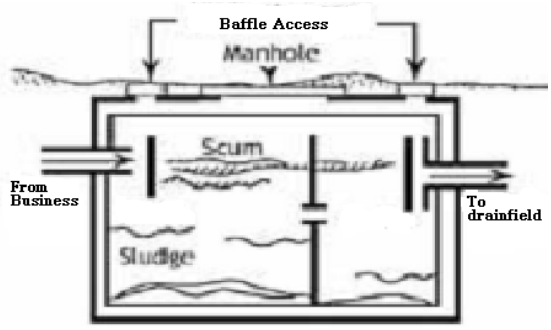
Large capacity septic systems fall under the EPA designation of "Class V Injection Wells" and are regulated by Underground Injection Control (UIC) programs set up by the EPA. In broad terms, this means commercial systems are subject to more stringent oversight than residential systems--out of heightened concern for contamination of groundwater by various types of Class V wells and shallow disposal systems. Of particular concern are systems receiving wastewater from industries and automotive service stations.

Tank Pumping Frequency

As with residential systems, regular, scheduled pumping of the septic tank is arguably the most essential element of large capacity septic system maintenance. The key difference lies in the frequency of pumping: commercial septic tanks typically require (much) more frequent pumping than their residential counterparts. There are several reasons for this:

- Faster rate of wastewater flow, resulting in greater likelihood of solids carry-over to drainfield
- Greater strength of wastewater (higher "organic load," that is, higher concentrations of solids and fats, oils and grease), resulting in faster accumulation of solids in septic tank
- Presence of higher strength cleaners and other chemicals not normally found in household wastewater, potentially resulting in harm to bacteria that breakdown wastewater in the septic tank
- Varied and changeable group of system users (employees and customers), resulting in somewhat lessened ability to control/enforce good maintenance practices (as compared to household)

How frequently you will need to have your particular tank pumped depends on a number of factors, including:



- Type and size of your establishment
- Size of your septic tank
- Volume and rate of wastewater flows
- Amount of organic matter (e.g., waste solids, food scraps, fats/oils/grease) in your establishment's wastewater

The first two factors are essentially fixed. If, however, your septic tank is undersized, you may need to replace it with a larger tank to improve the quality of wastewater treatment. The second two factors can be significantly influenced by your operational practices.

Here are some things you can do to avoid overstressing your septic system over the long term and using pumping (which will always be necessary, whatever your maintenance habits) as a substitute for good operational basics:

- *In restrooms*: make sure plumbing fixtures don't leak; install automatic shut-off faucets;
- *In kitchens*: divert kitchen wastewater to grease trap; scrape plates into the garbage, not the sink; install drain covers and sink baskets/strainers to prevent solids (food scraps, fats, oils and grease) from entering your system; avoid use of garbage disposal; use water-saving dishwasher cycle; use mild detergents, not harsh industrial cleaners; use paper towels rather than rags to mop up grease from counters, grills, etc.
- *In laundry facilities*: avoid use of harsh detergents; space out laundry over the course of the week rather than doing establishment's washing all at once

An inspection of your septic system by a licensed septic inspector (which should be an annual event) can help you determine the pumping frequency your tank requires. You should schedule pumpings with a licensed pumper based on your required frequency (e.g., every three months, twice a year). This same pumper can also pump out your grease trap. Note, however, that grease traps will almost always require more frequent pumping than your septic tank to function effectively.

Fats, Oils and Grease

The most serious problem that plagues large capacity septic systems is the carry-over of fats, oils and grease (sometimes referred to as FOG) into the drainfield (leachfield). When carry-over occurs, these materials reduce the absorption capacity of the drainfield and can lead to system overflows (i.e., breakout), at which point, depending on the extent of damage, the drainfield will need to be repaired, extended or even replaced.

The drainfield of a well-designed and maintained system can handle small amounts of FOG, such as natural body oils carried over from a household's shower water. However, drainfields or alternative treatment systems cannot accommodate significant concentrations of FOG, such as that produced by restaurants, bakeries, cafeterias and camps (and even households that are heavy garbage disposal users and regularly pour cooking grease down their drains).

For this reason, many counties and states require the use of grease traps (also called grease interceptors) by restaurants and similar commercial establishments. Grease traps are holding tanks; modified septic tanks that receive kitchen wastewater prior to the passage of that wastewater to the main septic tank. In the grease trap, wastewater is slowed and allowed to cool somewhat, giving fats, oils and grease a chance to settle out before the effluent passes to the septic tank, where further settling occurs. Grease traps generally range in size from one to three times the average daily flow that will be discharged into it. As with the main septic tank, proper sizing of the grease trap is critical to its ability to fulfill its function.

Operation and Maintenance

Good operation and maintenance practices enable the grease trap and septic tank to work effectively in reducing grease and oil. Restaurants and other establishments should:

- Scrape food scraps and congealed fats into the garbage
- Use drain covers and sink baskets and strainers to prevent solids from entering the flow of wastewater
- Eliminate the use of a garbage disposal
- Avoid pouring cooking oil and grease should down the drain
- Not rely on septic system additives that claim to reduce oils and grease. Although these additives do indeed dissolve oils and grease, this only increases the likelihood that these materials will be carried over to the drainfield rather than remaining in the grease trap and septic tank where they can be slowly broken down and pumped out at regular intervals.

Perhaps above all else, the key to the grease trap's effectiveness is regular, frequent pumpings. Depending on the size of the grease trap and the strength and flow of wastewater at a given commercial establishment, required pumping frequency may range from twice per month to once every three or six months. A proper pumping does not just remove the liquid in the grease trap but scours the grease trap and the associated lines to eliminate caked-on substances and oily residue. Pumping should be done by a licensed solid waste hauler who will dispose of grease and oils properly (e.g., in designated landfill areas).

Resources: Where can you get help?

For local assistance, check your phone directory for the following telephone numbers:

- County Environmental Health Department or Sanitarian's Office under *County Government* listings.
- *Septic tanks and Systems Cleaning and pump-and-haul contractors* in the yellow pages.

DEQ can provide information about state and federal requirements for:

- Safe alternatives for industrial chemicals
- Hazardous waste technical assistance
- Pollution prevention and planning
- Drinking water protection planning Underground injection control
- Shallow disposal systems
- Air and water quality compliance assistance
- Discharge permits
- Septic or other waste disposal systems
- Underground storage tanks
- Solid waste management and disposal

Call DEQ at (406) 444-6697 for assistance. You can also access DEQ's Internet Page at http://www.deq.state.mt.us/. If you would like more information on drinking water protection, please contact DEQ's Source Water Protection Program – Joe Meek 406-444-4806.

Montana State University Extension Service has several publications on septic systems and other topics available (406) 994-3273 or on the Internet at www.montana.edu/publications.

Contact EPA in Denver to learn about federal regulations pertaining to large capacity septic systems by calling (303) 312-6276 or visit EPA on the Internet at http://www.epa.gov/region8/water/uic/

The bottom line for a large capacity septic systems is:

- **Have a knowledgeable septic professional determine how frequently your tank and grease trap requires pumping,**
- **Set a maintenance schedule based on that and stick to it!**

Reference: Septic Information and Resources On-Line. Retrieved September 2003 from the World Wide Web: www.Septic-Info.com