LDS Church Belt
Source Water Delineation and Assessment Report

Public Water Supply:	**LDS Church Belt (PWSID #MT0003581)**
Report Date:	**July 21, 2005**
Contact Person:	**LDS Group/Great Falls PM Group C/O Steve Laelos PO Box 3184 Great Falls, MT 59403**

Introduction & Purpose

Bethany Haines, an intern with the Montana Department of Environmental Quality (DEQ) Source Water Protection Section completed the LDS Church Belt 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

LDS Church Belt is located in Cascade County, approximately two miles east of Belt on US Highway 89 (Figure 1). The well supplies water to the church. The well is located northwest corner of church property next to the tool shed. The LDS Church Belt water supply serves a transient population of about 40 people, through one service connection. 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 400 gallons per day, assuming water use 10 gallons per day per nonresident user (EPA, 1991).

The well log indicates it was completed in 2002 to a depth of 533 feet below ground surface (BGS). The static water level is 324 feet BGS with a pumping water level of 324 BGS. The lithology consists of layers of clay, sand, shale, and limestone. The aquifer that the well taps into is considered to be unconfined and is assigned a high sensitivity rating to potential contaminant sources in the area, in accordance with the Source Water Protection Guideline document (MT DEQ, 1999

As a transient non-community PWS, the system samples only for coliform bacteria and nitrate + nitrite as nitrogen. Coliform bacteria have not been detected in the past five years. Nitrate as

nitrogen was reported to be 0.16 mg/L (milligrams per liter) in January 2004 (most recent sample). No nitrate results are available for 2005.

Delineation

Methods and criteria for delineating these areas are specified in the Montana Source Water Protection Program (DEQ, 1999). For a transient PWS, two 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 would be excluded from this area. The control zone is the area within a 100-foot radius of the wellhead. For a transient PWS that is unconfined, the inventory region is the area within a one-mile radius. In some cases, hydrogeologic mapping (*e.g*. recognition of groundwater flow boundaries and direction) may reduce this area. Delineated source water protection areas are shown on Figure 2.

Inventory

Since the LDS Church Belt is a TNCWS 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 sources that the DEQ's Source Water Protection Section considers to be significant (as established in the Source Water protection program document (1999)). No potential sources of contamination were identified within the control zone but the exact separation distance between sewage collection and treatment is unknown. Generally, the control zone should be isolated from traffic and livestock, and drainage away from the wellhead should be maintained.

LDS Church Belt is connected to a large capacity septic system (LCSS) for waste disposal. The septic system is considered a large capacity septic system since it serves 20 or more people per day. The septic lines, tank, and drainfield are a potential source of contamination if a break or leak were to occur. Analysis of the area surrounding the LDS Church Belt complex reveals that the predominant land cover is grassland. The current production well is well #2 (completed in 2002), while well #1 is inactive. The distance between the wells in relation to each other or the degree of connection between any shallow water and the water in the Madison formation is unknown. Improperly installed or maintained wells can provide a conduit for surface contamination into groundwater.

Susceptibility Assessment

The LCSS is considered to be a high hazard as a potential source of contamination for nitrate and coliform bacteria since it is a point source and the well is sealed.

Table 1: Significant Potential Contaminant Sources

Source	Contaminant	Hazard Rating	Barriers	Susceptibility	Recommended Management Options
Large capacity septic systems	Nitrates, Pathogens	*High*	-Well intake > 100' BGS -Numerous alternating shale layers	*Low*	Properly operate and maintain on-site septic tank, drainfield and distribution lines (see attached Fact Sheet – Appendix C).
Abandoned or Inactive Wells	Pathogens, Nitrate, various others	*Not rated*		*Not rated*	Maintain in sanitary condition or properly abandon failing or unused wells.

Information on best management practices for septic systems is attached as Appendix C.

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 (sanitary survey) 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 LDS Church Belt, Inc. PWS- PWS ID: #MT0003581.
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 LDS Church Belt Water Supply.

APPENDIX A: Figures

Appendix B: Well Logs

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

LDS CHURCH BELT Well # 1 Inactive

Location Information

GWIC Id:	32052	Source of Data:	LOG
Location (TRS):	19N 06E 36 DCC	Latitude (dd):	47.3586
County (MT):	CASCADE	Longitude (dd):	-110.9039
DNRC Water Right:	C066891-00	Geomethod:	TRS-TWN
PWS Id:	03581002	Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	45.00	How Drilled:	CABLE
Static Water Level (ft):	22.00	Driller's Name:	BYRNE
Pumping Water Level (ft):	45.00	Driller License:	WWC318
Yield (gpm):	17.00	Completion Date (m/d/y):	10/27/1987
Test Type:	PUMP	Special Conditions:	
Test Duration:	4.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):		Geology/Aquifer:	Not Reported
Recovery Time (hrs):		Well/Water Use:	PUBLIC WATER SUPPLY
Well Notes:			

Hole Diameter Information

From	To	Diameter
0.0	45.0	8.0

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
-1.5	31.0	8.0	0.250			STEEL
25.0	45.0	6.0		160.00		PVC

Annular Seal Information

From	To	Description
0.0	0.0	BENTONITE

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
26.0	31.0	6.0		1/2IN	DRILLED HOLES

Lithology Information

From	To	Description
0.0	22.0	SANDY CLAY
22.0	31.0	GRAVEL WATER
31.0	44.0	GRAY SANDY SHALE
44.0	45.0	HARD GRAY SANDSTONE

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

THE CHURCH OF JESUS CHRIST OF LATTER DAY SAINTS Well #2 Active

Location Information

GWIC Id:	204711	Source of Data:	LOG
Location (TRS):	19N 06E 36 DDC	Latitude (dd):	47.3586
County (MT):	CASCADE	Longitude (dd):	-110.8981
DNRC Water Right:		Geomethod:	TRS-TWN
PWS Id:		Datum:	NAD27
Block:		Altitude (feet):	
Lot:		Certificate of Survey:	
Addition:		Type of Site:	WELL

Well Construction and Performance Data

Total Depth (ft):	440.00	How Drilled:	ROTARY
Static Water Level (ft):	324.00	Driller's Name:	PAT BYRNE
Pumping Water Level (ft):	324.00	Driller License:	WWC318
Yield (gpm):	50.00	Completion Date (m/d/y):	5/31/2002
Test Type:	PUMP	Special Conditions:	
Test Duration:	6.00	Is Well Flowing?:	
Drill Stem Setting (ft):		Shut-In Pressure:	
Recovery Water Level (ft):	324.00	Geology/Aquifer:	330MDSN
Recovery Time (hrs):		Well/Water Use:	DOMESTIC
Well Notes:			

Hole Diameter Information

From	To	Diameter
0.0	25.0	12.0
25.0	440.0	8.0
440.0	533.0	6.0

Casing Information[1]

From	To	Dia	Wall Thickness	Pressure Rating	Joint	Type
0.0	43.0	8.0	0.332		WELDED	STEEL
43.0	440.0	6.0	0.280		WELDED	STEEL

Annular Seal Information

From	To	Description
0.0	25.0	CEMENT

Completion Information[1]

From	To	Dia	# of Openings	Size of Openings	Description
440.0	533.0	6.0			OPEN HOLE

Lithology Information

From	To	Description
0.0	20.0	TOP SANDY CLAY AND SAND
20.0	25.0	BROWN CLAY GRAVEL SEAM
25.0	29.0	DARK SANDY CLAY
29.0	34.0	GRAVEL WET AT 30 FEET
34.0	42.0	GRAY SHALE SOFT
42.0	44.0	GRAY SANDY SHALE FIRM
44.0	46.0	GRAY BROWN SANDSTONE
46.0	68.0	HARD GRAY SANDY SHALE
68.0	80.0	VERY HARD DARK GRAY BROWN LIMEY SANDROCK
80.0	95.0	DARK GRAY SANDY SHALE
95.0	135.0	GRAY GREEN SANDY SHALE
135.0	140.0	GARK GRAY SANDY SHALE
140.0	220.0	GRAY SANDSTONE WITH THIN RUST SEAMS 5 GPM AT 194FT
220.0	240.0	DARK GRAY SANDSTONE MAKING MORE WATER 15 GPM TOTAL
240.0	259.0	HARD GRAY SANDROCK
259.0	264.0	VERY HARD DARK GRAY BLACK SHALEROCK
264.0	267.0	GRAY GREEN SANDY SHALE WITH BROWN LIMEY ROCK

267.0	269.0	HARD BROWN LIMEY ROCK
269.0	271.0	HARD LIGHT BROWN LIMEROCK
271.0	273.0	GRAY GREEN SANDY SHALE
273.0	280.0	VERY HARD DARK BROWN LIMEROCK
280.0	293.0	GREEN SANDSTONE
293.0	303.0	VERY HARD BROWN GRAYBROWN LIMESTONE
303.0	305.0	BROWN AND GRAY BROWN LIMESTONE SOFTER
305.0	320.0	HARD BROWN LIMESTONE
320.0	325.0	DARK GRAY SHALE LAYER
325.0	327.0	GRAY AND BROWN LIMESTONE
327.0	328.0	RUSTY BROWN LIMESTONE WITH GRAY AND DARK BROWN GLASSY MATERIAL
328.0	330.0	LIGHT BROWN LIMESTONE
330.0	335.0	LIGHT RUSTY COLORED LIMESTONE
335.0	383.0	VERY HARD GLASSY BROWN LIMESTONE
383.0	384.0	VERY HARD BLACK GLASSY LAYER
384.0	386.0	HARD BROWN LIMESTONE
386.0	405.0	LIGHT BROWN LIMESTONE WITH RUSTY LAYER AT 389 TESTED TOTAL WELL AT 25 GPM
405.0	410.0	BROWN LIMESTONE
410.0	413.0	LIGHT BROWN LIMESTONE SOFTER
413.0	415.0	GRAY AND BROWN LIMESTONE
415.0	416.0	LIGHT BROWN LIMESTONE
416.0	424.0	DARK BROWN LIMESTONE
424.0	432.0	GRAY LIMESTONE
432.0	440.0	LIGHT BROWN LIMESTONE WITH SOME RUST SMALL INCREASE IN WATER
440.0	460.0	VERY AHRD BROWN LIMESTONE SOME GLASSY
460.0	470.0	LIGHT BROWN LIMESTONE SOFTER
470.0	480.0	BROWN LIMESTONE
480.0	498.0	LIGHT BROWN LIMESTONE
498.0	506.0	LIGHT BROWN LIMESTONE GOOD BREAK PROBABLE GOOD WATER ZONE
506.0	530.0	HARD BROWN LIMESTONE THEN BROWN TO LIGHT BROWN 526-528 POSSIBLE WATER ZONE
530.0	532.0	VERY HARD GLASSY BROWN LIMESTONE
532.0	533.0	GOOD BREAK MORE WATER DROWN OUT DOWN HOLE HAMMER

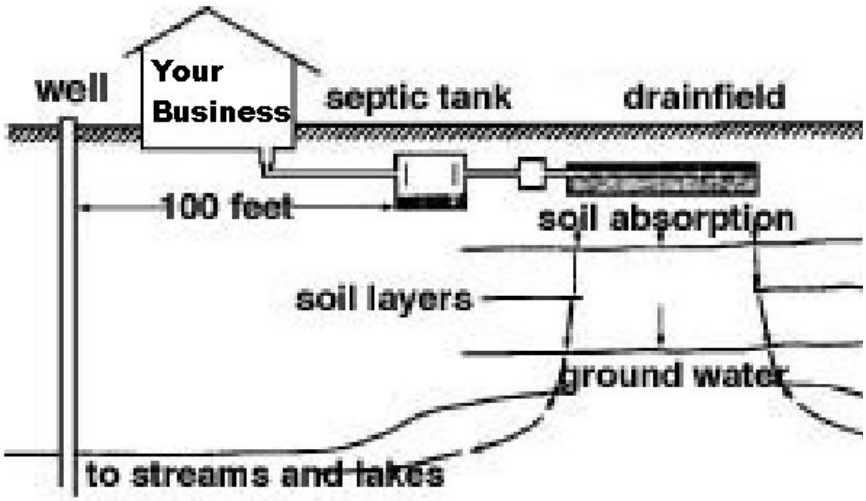
[1] - All diameters reported are **inside** diameter of the casing.

Appendix C: **Fact Sheet**

Large Capacity Septic System Operation and Maintenance

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.



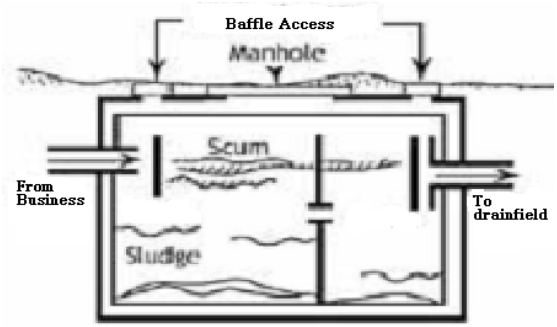
Large capacity septic systems fall under the EPA designation of "Class V Injection Wells" and are regulated by Underground Injection Control (UIC) programs set up by the EPA. In broad terms, this means commercial systems are subject to more stringent oversight than residential systems--out of heightened 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

Appendix D: Concurrence Letter