Protecting, maintaining and improving the health of all Minnesotans

DATE: March 8, 2007

TO: Licensed and Registered Well Contractors
Cindy Weckwerth, Washington County
Susan Hoyt, City of Lake Elmo
Brian Bachmeier, City of Oakdale
Advisory Council on Wells and Borings

FROM: John Linc Stine, Director
Environmental Health Division
P.O. Box 64975
St. Paul, Minnesota 55164-0975

PHONE: 651/201-4675

SUBJECT: **Notice of Designation of Special Well Construction Area, Lake Elmo-Oakdale, Washington County, Minnesota**

The Minnesota Department of Health (MDH) is designating a SPECIAL WELL CONSTRUCTION AREA (SWCA), which includes portions of Lake Elmo and Oakdale in Washington County, Minnesota (see Figure 1). The SWCA designation is effective March 15, 2007, and applies to the construction repair, modification, and sealing of wells and borings. The SWCA designation remains effective until further notice. This designation is an expansion and renaming of the existing Washington County Landfill SWCA, originally established in 1982. This expansion includes the Oakdale disposal site. The SWCA addresses the finding of more extensive groundwater contamination by perfluorochemicals in Lake Elmo and Oakdale.

AUTHORITY

Minnesota Statutes, section 103I, subdivision 5, clause 7 grants the commissioner of health the authority to establish standards for the construction, maintenance, sealing, and water-quality monitoring of wells in areas of known or suspected contamination. Minnesota Rules, part 4725.3650, details the requirements for construction, repair, and sealing of wells within a designated SWCA, including plan review and approval, water-quality monitoring, and other measures to protect public health and prevent degradation of groundwater.

SITE HISTORIES

The Washington County Landfill is located approximately one-quarter mile south of Lake Jane in Lake Elmo, Minnesota. It was initially permitted as a solid waste landfill by the Minnesota Pollution Control Agency (MPCA) in 1969 and operated until 1975. The

landfill received approximately 2.5 million cubic yards of municipal and industrial wastes (MPCA 2004). In 1981, sampling of on-site monitoring wells and off-site private wells to the south and southwest indicated the presence of volatile organic chemicals (VOCs), including trichloroethylene and tetrachloroethylene, and metals in groundwater. A "Well Advisory," of approximately 1 square mile, was established on July 19, 1982. The advisory covered an area from the landfill south to Highway 5. The advisory boundaries were revised in 1983 and, in 1993, the advisory became a SWCA. Due to the presence of VOC contamination, the SWCA required persons proposing to construct or seal wells within the SWCA to obtain written plan approval from the MDH prior to beginning work. This SWCA has been in effect to the present.

In 1983, Ramsey and Washington Counties installed a groundwater remediation system, including a gradient control well system with spray irrigation to remove VOCs. In 1996, the site entered the MPCA-administered Closed Landfill Program and the MPCA has taken additional steps to improve the landfill cover and the groundwater remediation system. Municipal water service, provided by the Oakdale municipal system, was extended into the SWCA in 1986, and private wells were sealed.

The Oakdale disposal site (actually three sites - Abresch, Brockman, and Eberle) was used in the 1940's through 1960's for disposal of commercial, industrial, and residential wastes. Disposal was via burying containers and solid materials in trenches, dumping liquids on the ground or in pits, and burning materials in pits. The site investigation began in 1980. Contaminants detected at the site include methyl ethyl ketone, acetone, toluene, isopropyl ether, and other VOCs. A number of remedial actions were taken, including excavation and disposal/incineration of wastes and contaminated soils, sealing 39 multiaquifer (Platteville limestone – St. Peter sandstone) wells and connecting potentially affected well owners to the Oakdale municipal water supply, installation and operation of a groundwater remediation system (12 extraction wells) in the unconsolidated aquifers, and installation of a groundwater monitoring system (Minnesota Department of Health, 1993).

PERFLUOROCHEMICALS

In 2003, the MPCA began investigating a family of chemicals called "perfluorochemicals" (PFCs) that were used in products resistant to heat, oil, grease, and water, and which appear to be persistent in the environment. These compounds were used in a wide array of products and materials, including nonstick cookware, stain- and water-resistant fabrics, fire-suppression foams, film coatings and other consumer and commercial products.

PFCs were produced by the 3M Company (3M) at its Cottage Grove facility. Wastes from this production were disposed at the Washington County Landfill and at the Oakdale disposal site. The initial investigations focused on two specific PFCs in groundwater – perfluorooctanoic acid (PFOA) and perfluorooctane sulfonate (PFOS). Testing of monitoring wells in 2003 at the Washington County Landfill and the Oakdale disposal site identified the presence of PFOA and PFOS. In 2004, 32 private wells near the Washington County Landfill were tested for PFCs. PFOA was detected at low levels in seven wells.

In December 2004, initial sampling of the Oakdale municipal wells identified five wells showing the presence of PFOA and PFOS. Testing expanded in early 2005 to investigate private wells in Lake Elmo, south and southwest of the Washington County Landfill. Findings indicated that PFOA and PFOS had migrated far beyond the distribution of the VOC contaminant plume and the boundaries of the original SWCA.

In the Spring 2006, testing was expanded to include five additional perfluorochemicals:

- perfluorobutane sulfonate (PFBS),
- perfluorobutanoic acid (PFBA),
- perfluoropentanoic acid (PFPeA),
- perfluorohexane sulfonate (PFHxS), and
- perfluorohexanoic acid (PFHxA).

Three of the chemicals (PFPeA, PFHxS, and PFHxA) were found in private wells that had previous detections of PFOA and PFOS. However, PFBA was detected in 204 wells that show the presence of no other PFCs. To date, 425 private wells and noncommunity public water-supply wells have been sampled and tested for PFCs. The testing results showed 92 wells with no detection of PFCs, 129 wells with multiple PFCs present, and 204 with only PFBA present. MDH advised that 151 wells should not be used for consumptive uses because of PFOS/PFOA/PFBA exceedances of the Health-Based Values (HBVs) or well advisory guidelines or a combination of PFCs exceeding a health index of greater than or equal to one. Some of the areas impacted include the Lake Elmo Heights, Tablyn Park, Torre Pines, and Parkview neighborhoods of Lake Elmo, extending south-southwest of the Washington County Landfill. PFBAs were also detected in a sixth Oakdale municipal well and in a recently-constructed municipal well in Lake Elmo that has not been put into service, and at very low levels in 16 Woodbury municipal wells, south of Interstate 94.

Additional testing in January-February 2007 indicated that PFBA contamination is found throughout much of southwest Washington County and part of northern Dakota County, affecting wells and public water-supply systems in Cottage Grove, Hastings, Newport, South St. Paul, and St. Paul Park. Investigations and well testing are continuing to better determine the extent and magnitude of contamination, assess source areas, and address remedial options. These findings south of Interstate 94 are not the subject of this SWCA, but may be addressed in a future SWCA designation.

RESPONSE ACTIONS

3M provided the city of Lake Elmo with a $3.3 million grant to extend the municipal water supply to service the Lake Elmo Heights and Tablyn Park neighborhoods. The grant is expected to cover the extension of watermains, connection of 214 homes to municipal service, and permanent sealing of the wells serving those homes. The extension of municipal water service is scheduled for completion in early 2007, at which time sealing of the private wells will occur.

In 2005, the MPCA began providing granular activated carbon (GAC) treatment for wells that exceeded the HBVs, well advisory guidelines, or had a hazard index of greater than or equal to one. Existing wells outside the area of the proposed municipal water-supply expansion are eligible for GAC treatment. The MPCA is providing bottled water until GAC treatment or an alternate water supply can be provided to these wells. New or replacement wells must meet the requirements of this SWCA.

In October 2006, the city of Oakdale began operation of a GAC filtration plant, designed to remove PFCs from water supplied by the two public water-supply wells having PFOA/PFOS concentrations exceeding HBVs. The design, construction, and operation costs were covered by 3M. During periods of high water demand, the city attempts to minimize PFC levels by careful management of use of the municipal wells.

SWCA HYDROGEOLOGY

The surficial geology of the Lake Elmo/Oakdale area consists of 50-150 feet of unconsolidated materials, comprised of glacial till deposits associated with the St. Croix Moraine. Lacustrine and wetland deposits are predominant in Oakdale, and glacial outwash is more widespread in Lake Elmo (Minnesota Geological Survey, Plate 3, 1990).

These materials are underlain by Paleozoic-era sedimentary rocks of interbedded dolostone/limestone, sandstone, and shale units (see Figure 2). These bedrock units have a slight southwesterly dip, reflecting the fact that this area is on the eastern flank of the Twin Cities Basin (Barr Engineering Company, 2005). In the northwestern corner of the SWCA, a remnant of the Decorah shale is present, and, in fact, directly underlies the Abresch disposal site in Oakdale. The first bedrock unit underlying most of Oakdale is the Platteville limestone/Glenwood shale. Further east, these units are eroded and, progressively eastward, the St. Peter sandstone, or the Prairie du Chien group, is the first bedrock encountered beneath the surficial materials. The first bedrock underlying the Washington County Landfill is the Prairie du Chien group.

A major groundwater divide bisects Washington County from north to south, with groundwater east of the divide moving eastward and discharging to the St. Croix River and groundwater west of the divide moving west-southwest towards the Mississippi River (Minnesota Geological Survey, Plate 5, 1990). The eastern boundary of the SWCA is located just east of this divide. Within the SWCA, groundwater flow within the drift and outwash deposits can be variable. Flow is controlled by local discharge/recharge points, the presence of confining layers, groundwater withdrawals, and land use. For instance, the groundwater remediation system at the Washington County Landfill and the presence of bedrock with low permeability at the Oakdale disposal site create mounding conditions that produce radial flow in the local groundwater. Groundwater levels and flow directions are also influenced by recharge from losing streams (i.e., Raleigh Creek) and by natural discharge to local lakes and streams.

Regional groundwater flow in the bedrock, particularly the St. Peter sandstone and the Prairie du Chien group, is generally to the southwest. The distribution and migration of PFCs to the south – southwest reflect this groundwater flow direction. The contaminant plume is also gradually "sinking" into deeper formations and dispersing along the transport path. PFC contamination tends to be limited to the drift and St. Peter sandstone in the northern third of the SWCA and is found in the Prairie du Chien dolomite and Jordan sandstone in the southern two-thirds of the SWCA.

ENVIRONMENTAL AND PUBLIC HEALTH CONCERNS

PFCs are synthetic chemicals that are not natural to the environment. They are found both as an ingredient in manufacturing processes and as part of some finished products. Unlike most organic compounds that tend to degrade in the environment or are adsorbed onto

natural materials, PFCs are very stable compounds and appear to be resistant to environmental degradation. In addition, these compounds can be transported widely in the environment, in general, and in groundwater, in particular. Some PFCs (primarily PFOA and PFOS) have been found to bioaccumulate (Minnesota Department of Health, 2005). Because of these characteristics, uses of groundwater for purposes other than drinking, such as irrigation and other nonconsumptive uses, may also be of concern.

PFCs are a relatively new family of environmental contaminants and there are limited numbers of studies of health effects in people. In animal studies, high concentrations of PFCs harm the liver and thyroid. Developmental problems have been seen in the offspring of rats and mice exposed to PFCs while pregnant. Studies of 3M workers exposed to PFOS and PFOA during manufacturing show no apparent impacts to their health. There is no similar health study information for the general population. However, the U.S. Environmental Protection Agency and other researchers are investigating the potential health effects on the general population and on other populations who are exposed to PFCs in their drinking water.

On March 1, 2007, the MDH issued revised HBVs, which are 0.5 micrograms/liter (μg/l) for PFOA and 0.3 μg/l for PFOS. A HBV is the concentration of a groundwater contaminant, or mixture of contaminants, that poses little or no risk to health, even if consumed over a lifetime. The MDH also recommends that consumers limit or reduce their intake of water that has a concentration of PFBA exceeding 1 μg/l. The MDH continues to evaluate toxicity data in order to calculate a HBV for PFBA in the future.

BOUNDARIES OF THE SPECIAL WELL CONSTRUCTION AREA

The boundaries of the existing SWCA, last revised in 1983, were as follows:

- Northern boundary of Lake Jane Hills Park, and west following an irregular boundary of Ivy Court North to Isle Avenue North.
- The alignment of Isle Avenue North to approximately 37th Avenue north, then west to the alignment of Irvin Circle North, then south to Highway 5.
- Highway 5 on the south, between Iris Avenue North and the midpoint of Section 15 (immediately east of intersection with 31st Street North.
- The north-south centerline of Section 15 and that part of Section 10 to the north boundary of Lake Jane Hills Park.

The location of the revised SWCA is shown on the attached map (Figure 1). Encompassing the area described above, the revised SWCA includes the following:

- Ramsey-Washington County line on the west (County Road 120, also known as Century Avenue or Geneva Avenue).
- Interstate 94 on the south, from county line to Lake Elmo Avenue.
- Lake Elmo Avenue on the east, extending from Interstate 94 to Highway 5 (Stillwater Boulevard North in Lake Elmo, 34th Street North in Oakdale) and, then, to 47th Street North.
- 47th Street North-Lake Jane Trail to Ideal Avenue North on the north, then southward to Highway 5, then westward to Ramsey-Washington County line.
- The area between Granada Avenue North and Hadley Avenue North, north of Highway 5 and south of 35th Street North.

The SWCA includes all of sections 14-16, 19-23 and 26-35 and portions of sections 9-11, 13, 17-18, and 24 of Township 29 North and Range 21 West.

REQUIREMENTS OF THE SPECIAL WELL CONSTRUCTION AREA

1. All wells and borings regulated by the MDH are subject to the requirements of this SWCA. Wells include water-supply wells (domestic, public, irrigation, commercial/industrial, cooling/heating, remedial, monitoring wells, and dewatering wells). Borings include environmental bore holes, elevator borings, and vertical heat exchangers. Notifications and permit applications, and their respective fees, must be submitted to the MDH.

2. Construction of a new well or boring, or modification of an existing well or boring, may not occur until plans have been reviewed and approved in writing by MDH. In addition to the normally required notification or permit application and fee, the plan must include the following information: street address; well or boring depth; casing type(s), diameter(s), and depth(s) for each casing; construction method(s), including grout materials and grouting methods; anticipated pumping rate; and use.

3. As a condition of the well construction plan approval, the well owner must agree to pay for a PFC analysis of the water, to be performed by the MDH Public Health Laboratory. Copies of analytical results will be forwarded to the well owner, the MPCA, Washington County Department of Public Health and Environment, and the city of Lake Elmo (or Oakdale). The MDH will review the analytical results and determine if the well can be completed, if the well must be drilled deeper, or if the well must be permanently sealed.

4. Special well construction and/or monitoring requirements may be imposed on a well/boring completion, location and use in order to protect the public health and groundwater quality and to prevent contaminant migration. These requirements will be based on available knowledge of groundwater contaminant movement near the well location and the proposed use and pumping rate of the well.

5. No potable water-supply wells may be completed in areas served by a community public water-supply system. The city of Lake Elmo has indicated that future new developments must be served by a community public water-supply system. For areas not served by a community system, potable water-supply wells may be allowed serving individual lots within already existing developments or replacing existing wells that go out of service. Potable water-supply wells may not be completed within the Platteville limestone, St. Peter sandstone, Prairie du Chien group, or Jordan sandstone without approval on a site-specific basis. For purposes of this SWCA, "potable use" includes any consumptive or other uses involving human contact, including drinking, cooking, bathing, recreation, manufacturing or processing of food, drink, or pharmaceuticals, or to supply water to fixtures accessible to humans.

6. Potable wells completed in the Franconia sandstone or Ironton-Galesville sandstones will be permitted throughout the SWCA. However, these wells must be cased and grouted through the full thickness of the St. Lawrence formation. Casing and grout must extend from at least 20 feet below the St. Lawrence formation to the surface.

7. Approval of plans and specifications for construction of a community public water-supply well and of the well site is required by Minnesota Rules, part 4725.5850. The MDH may approve completion of a public water-supply well within the designated SWCA if the system owner/operator can demonstrate that the water delivered to the distribution system meets Maximum Contaminant Levels (MCLs) established by the U.S. Environmental Protection Agency or other health guidelines referenced by the MDH, either through treatment, blending with other sources, monitoring, or other mechanisms.

8. A well completed in one of the geologic formations named in item 5 and used for a nonpotable purpose, such as groundwater quality monitoring or construction

dewatering, may be allowed, provided that the MDH and the MPCA determine that the well will not interfere with remediation efforts, cause further spread of contamination, or result in environmental or human exposures in excess of public health and environmental standards.

9. No well or boring in bedrock may be permanently sealed until the MDH has reviewed and approved the plans for the proposed sealing. In addition to the required notification and fee, the plan must include the following information: street address; original well/boring depth; current well/boring depth (if different); casing type(s), diameter(s), and depth(s); methods of identifying and sealing any open annular space(s); methods for identifying and removing any obstruction(s); grout materials and placement methods.

10. All other provisions of Minnesota Rules, Chapter 4725, are in effect.

WELL DISCLOSURE IN WASHINGTON COUNTY

Before signing an agreement to sell or transfer real property in Washington County that is not served by a municipal water system or is served by a municipal water system but has an unsealed well, Minnesota Statutes, section 103I.236, requires the seller to state in writing to the buyer whether, to the seller's knowledge, the property is located within a SWCA. Figure 1, details the Lake Elmo – Oakdale SWCA. This disclosure is in addition to the disclosure of the number, location, and status (in use, not in use, or sealed) of all wells on a property as required for all property transfers in Minnesota, as required under Minnesota Statutes, section 103I.235.

PERSONS TO CONTACT

For additional information regarding this SWCA, please contact Mr. Michael Convery of the MDH at 651/201-4586 or Michael.Convery@state.mn.us.

Plans for construction, repair, or sealing of wells and borings within the SWCA must be submitted to:

Mr. Patrick Sarafolean
Minnesota Department of Health
Well Management Section – Metro District
P.O. Box 64975
St. Paul, Minnesota 55164-0975
651/643-2110
Patrick.Sarafolean@state.mn.us

Notifications/permit applications for either construction or sealing of wells and borings must still be mailed or faxed to the MDH Central Office at:

Minnesota Department of Health
Well Management Section
P.O. Box 64975
St. Paul, Minnesota 55164-0975
651/201-4599

For information regarding public health concerns, please contact:

James Kelly/Virginia Yingling
Minnesota Department of Health
Site Assessment and Consultation Unit
P.O. Box 64975
St. Paul, Minnesota 55164-0975
(651)201-4910/(651)201-4930
James.Kelly@state.mn.us/Virginia.Yingling@state.mn.us

For information regarding the investigation, monitoring, and remediation of the ground water contamination, please contact:

Ms. Ingrid Verhagen/Mr. Shawn Ruotsinoja
Minnesota Pollution Control Agency
(651)296-7266/(651)282-2382
Ingrid.Verhagen@state.mn.us/Shawn.Ruotsinoja@state.mn.us

REFERENCES

Barr Engineering Company 2005, Washington County Landfill and Oakdale Disposal Site Groundwater Flow and Contaminant Transport Modeling, 23p.

Minnesota Department of Health, 1993, Site Review and Update – Oakdale Dump Site, CERCLIS Number MND980609515, 12p.

Minnesota Department of Health, 2005, Environmental Health Information – Perfluorochemicals and Health, 2p.

Minnesota Department of Health, 2006, Update: Perfluorochemicals and Private Drinking Water Wells in Lake Elmo, 2p.

Minnesota Geological Survey, 1990, *Hydrogeology* in Geologic Atlas – Washington County, Minnesota. County Atlas Series C-5, University of Minnesota – Plate 5.

Minnesota Pollution Control Agency, 2005, Minnesota Pollution Control Agency's Closed Landfill Program, Annual Report 2004, Washington County Sanitary Landfill SW-001.

JLS:MPC:jmw

Figure 1

Special Well Construction Area
Lake Elmo - Oakdale
Washington County

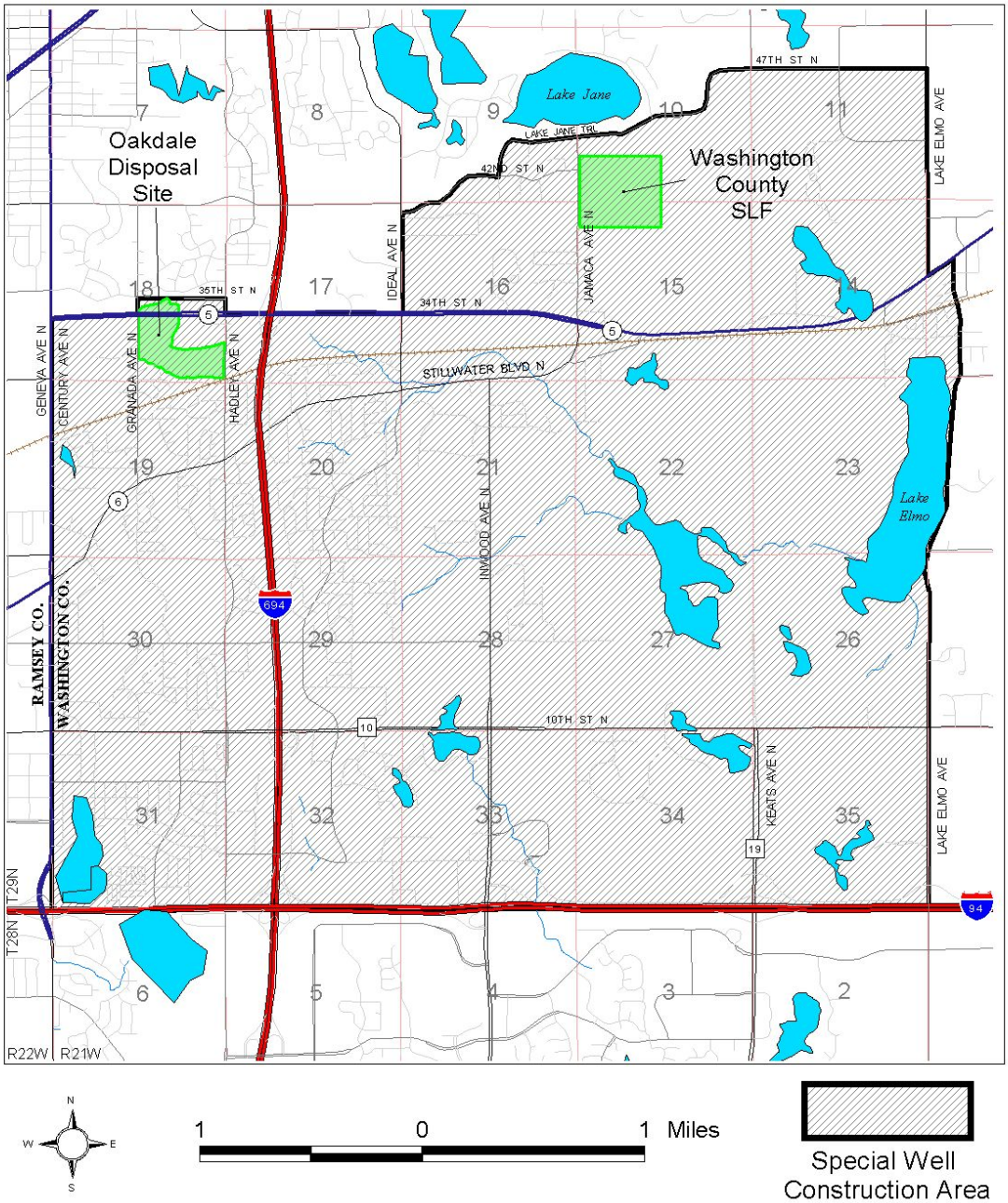
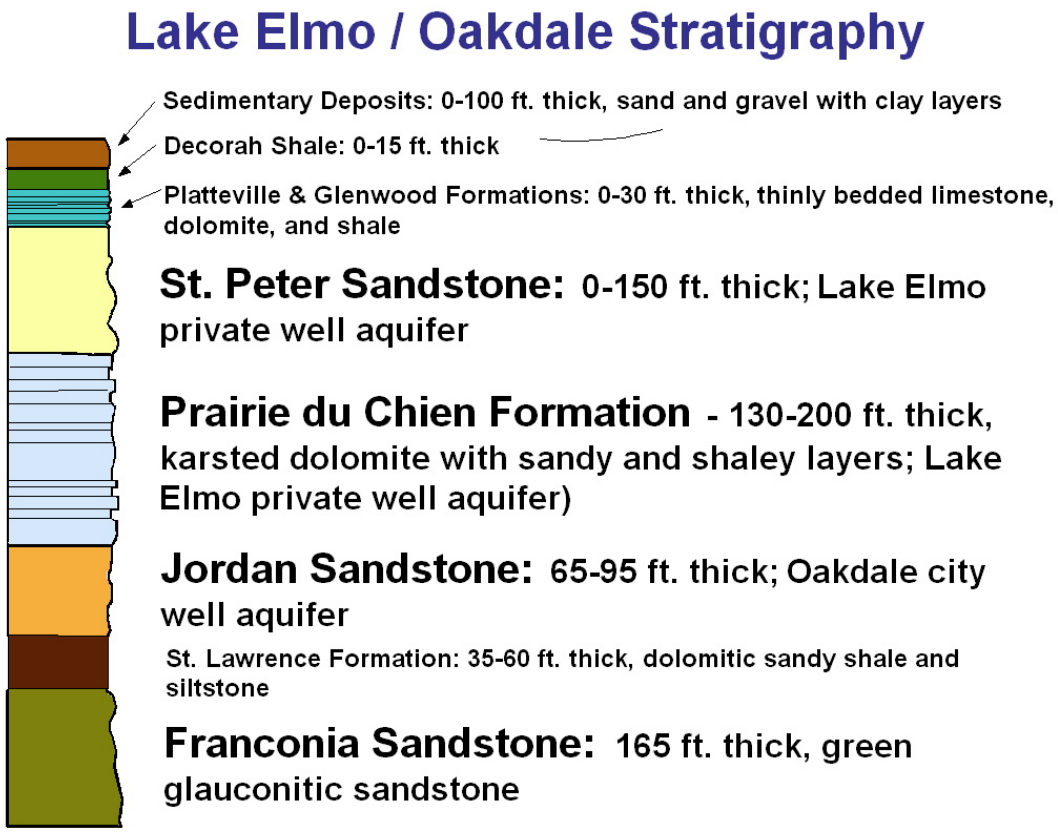


Figure 2


Lake Elmo / Oakdale Stratigraphy
Sedimentary Deposits: 0-100 ft. thick, sand and gravel with clay layers
Decorah Shale: 0-15 ft. thick
Platteville & Glenwood Formations: 0-30 ft. thick, thinly bedded limestone, dolomite, and shale
St. Peter Sandstone: 0-150 ft. thick; Lake Elmo private well aquifer
Prairie du Chien Formation - 130-200 ft. thick, karsted dolomite with sandy and shaley layers; Lake Elmo private well aquifer)
Jordan Sandstone: 65-95 ft. thick; Oakdale city well aquifer
St. Lawrence Formation: 35-60 ft. thick, dolomitic sandy shale and siltstone
Franconia Sandstone: 165 ft. thick, green glauconitic sandstone