ANSWERS TO QUESTIONS FREQUENTLY POSED BY RESIDENTS

REPRINTED FROM CRA REPORT: GROUNDWATER AND RESIDENTIAL WELL EVALUATION NORTH OAKS, MINNESOTA

HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

7.0 ANSWERS TO QUESTIONS FREQUENTLY POSED BY RESIDENTS

This section of the report was prepared to address questions posed by residents in North Oaks.

7.1 WHAT ARE THE "HEALTH RISK LIMITS" THAT HAVE BEEN PUBLISHED BY THE MINNESOTA DEPARTMENT OF HEALTH FOR DRINKING WATER FROM RESIDENTIAL WELLS?

Pursuant to the Minnesota Groundwater Protection Act of 1989, the MDH has adopted permanent rules defining health risk limits ("HRLs") for 120 contaminants that have been found in Minnesota groundwater. The MDH defines a HRL as an exposure value for a concentration of a groundwater contaminant, expressed in micrograms per liter (µg/L), that can be safely consumed daily for a lifetime. For carcinogenic compounds, the MDH uses a 1 in 100,000 excess cancer risk for establishing the HRL.

The MDH uses its HRLs to determine if a private water supply is acceptable as a drinking water source. When a HRL is reached or exceeded, the MDH will generally issue a drinking water well advisory. This advisory is a recommendation to the homeowner that an alternate source of water should be used or that some form of treatment should be undertaken. In some instances where multiple chemicals are detected in a well, the MDH will take a conservative approach and issue a drinking water well advisory even though no individual HRL has been exceeded. The MDH considers a value which is equal to the HRL to be an exceedence.

Table 7.1 is a summary of existing HRLs for compounds that have recently been detected in samples collected from residential wells in North Oaks.

The MDH is currently evaluating potential changes to the HRLs. The current HRL for vinyl chloride is 0.2 µg/L. The proposed HRL for vinyl chloride is 0.08 µg/L. A scientific review of the proposed HRL is being conducted and any changes to the HRL are likely to be more than a year away.

7.2 WHAT IS THE DIFFERENCE BETWEEN HRLs AND MAXIMUM CONTAMINANT LEVELS (MCLs) FOR MUNICIPAL WATER

As described above, HRLs are state standards that apply to drinking water from private residential wells. "Maximum Contaminant Levels" ("MCLs") are federal standards which have been developed by the USEPA under the federal Safe Drinking Water Act

and which apply to public water supplies. MCLs do not apply to private water supplies. For example, the City of Edina, which has vinyl chloride in its municipal water supply, is required to meet the MCL for vinyl chloride of 2.0 µg/L. This health standard is 10 times. higher (i.e., 10 times less stringent) than the vinyl chloride HRL of 0.2 µg/L applied by the MDH to private wells in the State.

The USEPA has determined that vinyl chloride at the MCL (2.0 µg/L) is a safe level for consumption over a lifetime.

7.3 HOW DOES THE MINNESOTA HRL FOR VINYL CHLORIDE COMPARE TO SIMILAR HEALTH STANDARDS FOR VINYL CHLORIDE THROUGHOUT THE UNITED STATES?

CRA maintains an informal database of drinking water standards based on work conducted on projects throughout the United States and in other countries. From this database, drinking water standards for vinyl chloride have been summarized and are provided in Appendix F. Table 7.2 presents a summary of enforceable drinking water standards for vinyl chloride for 34 states, two countries, the European Union, and the World Health Organization. Although the list is not a complete evaluation of all drinking water standards, it shows that Minnesota have one of the most stringent standards for vinyl chloride. Because only a few states use standards lower than the federal one, the scientific community has not studied that the fate and transport of vinyl chloride at levels as low as those currently being found in North Oaks. In addition, very few commercial laboratories are set up to measure vinyl chloride at the levels of the current HRL (0.2 µg/L) let alone the proposed HRL (0.08 µg/L).

7.4 ARE THERE HEALTH RISKS ASSOCIATED WITH ACTIVITIES OTHER THAN DRINKING WATER THAT CONTAINS VINYL CHLORIDE?

Exposure to vinyl chloride from drinking water would be from ingestion. Exposure to vinyl chloride from such activities as bathing or showering, would be from inhalation. A recent study completed by Kerger and others in 2000[6] used actual measurements in both water and air that were taken from actual homes and estimated that the exposure risk through inhalation of VOCs is less than the exposure risk through ingestion by a factor of three to four. A more detailed draft write up, which was completed by the MDH, is presented in Appendix G.

[6] Kerger, B.D., C.E. Schmidt, and D.J. Paustenbach. 2000. Assessment of Airborne exposure to Trihalomethanes from Tap Water in Residential Showers and Baths. Risk Analysis, 20, pp. 637-651.

7.5 HAVE OTHER COMPOUNDS BEEN FOUND IN RESIDENTIAL WELLS AT LEVELS HIGHER THAN THE APPLICABLE HEALTH RISK LIMITS?

Groundwater monitoring at residential wells has been ongoing for the past 19 years. A total of 133 residential wells have been sampled for over 60 chemicals. CRA compared the database, dating back to 1993, to the existing HRLs. Vinyl chloride and carbon tetrachloride are the only compounds that has ever been detected at levels exceeding a HRL in the residential wells since 1993, which is the year extensive residential well testing began. However, the converted residential well location (11 Lily Pond) that detected carbon tetrachloride in 1996 has not detected that compound in nine other sampling events.

Given the above, vinyl chloride is the contaminant of principal concern.

7.6 ARE SEPTIC SYSTEMS POTENTIAL SOURCES TO GROUNDWATER CONTAMINATION?

Each home in the North Oaks study area has a septic system. A typical household discharges 300 gallons per day of sewage into its septic system, which, by design, relies upon the underlying soils to filter the waste before it reaches the groundwater. Thus, it can be estimated that the 60 homes located east of Gilfillan Lake discharge between 6 and 7 million gallons of waste per year to the ground (60 homes x 300 gallons / day x 365 days / yr). Similarly, the 45 homes located west of Gilfillan Lake discharge almost 5 million gallons per year.

Septic systems are composed of two treatment components, the septic tank and the drainfield or soil treatment system. Water is piped from a home to the buried septic system. Liquids flow through the septic tank to the drainfield and into subsurface soil. Septic systems are biological treatment systems designed to treat household wastewater by using bacteria and other microbes to break it down. They are not designed to treat organic solvents, such as trichloroethylene (TCE) or perchloroethylene (PCE), which pass through the system, leach into the soil and can impact groundwater.

Historically, TCE and PCE were commonly used as septic tank cleaners (sometimes packaged as brand name cleaners). Being aggressive degreasers, these solvents were effective at cleaning grease from inside pipes and septic tanks. Septic tank owners have also used PCE and TCE to break down the sludge built up in their septic tanks,

supposedly causing it to pass through the septic tanks and thereby delaying the need to pump out the sludge.

In addition to septic tank cleaners, numerous other household products contain TCE or PCE, including spot removers for fabrics, carpet cleaners, paint strippers, engine degreasers, adhesives, and glues. When these products are flushed down the drain of a home with a septic system, they flow to the leach field of the septic system and can find their way to the groundwater.

TCE and PCE can biodegrade into vinyl chloride as they migrate through groundwater. Figure 7.1 illustrates the biodegradation pathway from PCE to vinyl chloride and beyond to a non-toxic end member. The biodegradation processes involves the removal of chloride ions due to naturally occurring microorganisms or chemical oxidation processes. Very little vinyl chloride is required to negatively affect a large volume of aquifer. For instance, less than an ounce of vinyl chloride can result in a 5 million cubic foot aquifer having an average concentration of 0.2 µg/L. Because of this biodegradation pathway, regulators commonly recognize residential septic systems as potential sources of vinyl chloride contamination. For example, the USEPA website lists vinyl chloride as one groundwater contaminant caused by residential septic systems.

Detailed information on septic systems is presented in Appendix H.

7.7 CAN NORMAL MUNICIPAL WASTE BE A SOURCE OF VINYL CHLORIDE?

Yes. Many sources of VOCs (including vinyl chloride) are used in every day residential activities. Empty (or partially empty) containers of household products that are sent to a landfill often contain a residue of hazardous substances that can eventually enter the groundwater. Technical literature confirms that municipal solid waste (MSW) contains many of the same hazardous substances, including vinyl chloride, that have been found at the Highway 96 Site. The formation of vinyl chloride from MSW occurs even when the disposal of industrial waste has not occurred. In fact, the MSW at the Site would have caused groundwater contamination even if industrial waste from Whirlpool and Reynolds had never been placed in the dump.

7.8 WHAT IS THE MEANING OF "SPLIT SAMPLES," AND OF OTHER TECHNICAL TERMS COMMONLY FOUND IN LABORATORY REPORTS?

In various reports, presentations, and fact sheets that have been distributed or made to residents, there have been references to "split samples", "blanks", "duplicates," and other technical terms commonly used by laboratories. All these terms are used to describe quality assurance / quality control (QA / QC) measures that are undertaken to assure that data is accurate. This section attempts to explain these terms.

"Split samples" are samples that are taken by two individuals at the same time and at the same location, but that are generally submitted to different laboratories for analysis. The results of split samples should be substantially similar. Significantly different results indicate that something maybe wrong with the analysis.

The use of "blanks" or "trip blanks" also help to ensure the overall quality of a sampling event. A "blank" is a laboratory prepared sample that is provided by the laboratory with the empty sample bottles, transported with the samples throughout the groundwater sampling event, returned to the laboratory with the samples, and analyzed in the same manner as the actual samples. The detection of any contaminants in the "trip blank" indicates that the actual samples may have also become contaminated along the way. There are also "lab blanks" that are analyzed in the laboratory to determine if any "contamination" has been caused by the laboratory. Lab blanks are prepared in the same manner as trip blanks, but are kept in the lab. There are several commonly used chemicals that can affect samples in the laboratory, such as methylene chloride and acetone.

A "duplicate" or "blind duplicate" is yet another QA / QC sample. It is a second sample taken at the same time as the first, but given a different label and sample number. The laboratory analyzes these two samples not knowing they are from the same location. The concentrations of both samples should be similar.

There will always be a slight variation between samples and sampling events. The QA / QC sample results is a critical piece of information when evaluating the data.

7.9 DO DIFFERENT LABORATORIES HAVE DIFFERENT DETECTION LIMITS ?

Yes, different laboratories can have different detection limits. The lower the detection limit, the more difficult and expensive it is to run the test, so laboratories employ lower

detection limits only when they have to, in order to measure a sample against a very low standard. In Minnesota and Wisconsin, where the health standard for vinyl chloride is lower than it is in most places, laboratories need to achieve lower detection limits than they do elsewhere.

The detection limit is developed based on the calibration of the testing equipment against known calibration standards. Different laboratories may establish different detection limits even though they may be based on the same health standards. For example, most laboratories servicing the Wisconsin and Minnesota market place try to achieve a detection limit below the health standard, which is 0.2 µg/L, but some laboratories will have a detection limit of 0.16 µg/L while others will have a detection limit of 0.10 µg/L. In addition, a laboratory may vary its own detection limit based on the performance of the equipment and possible interference in the sample itself.

7.10 WHY IS THE DIFFERENCE BETWEEN METHOD DETECTION LIMIT AND REPORTING LIMIT?

The method detection limit is the limit that a particular instrument can distinguish an actual chromatographic "peak" from background instrument "noise". At a minimum, laboratories perform MDL studies to calculate an MDL on an annual basis. Thus, the MDL may vary from year to year. Laboratories typically report to a reporting limit or reporting level (RL). The RL is the level, or concentration, of the lowest calibration standard that was used to calibrate the instrument. Results above the RL are quantifiable. Results between the RL and MDL are typically reported as "estimated" or "peak present", because they were detected below the range that the instrument was calibrated. An example of MDL and RL limits from the laboratories used under this six month study is provided below:

Laboratory	***RL***	***Lowest MDL***
Interpoll Laboratories	2.0 µg/L	0.083 µg/L
Minnesota Department of Health	0.2 µg/L	0.1 µg/L
Severn Trent Laboratories	0.5 µg/L	0.16 µg/L

7.11 WHY HAVE SOME LABORATORY REPORTS BEEN AMENDED?

Laboratories have standard report formats for reporting their analytical data. The standard report format always includes pertinent sample information and associated analytical results, but laboratory QA/QC information is not always included.

Nevertheless, laboratory QA/QC is always performed and QA/QC results can be included in the laboratory report, if specifically requested. When requested, the standard laboratory report format is "amended" to include the QA/QC information.

MPCA and CRA obtained QA/QC data associated with each laboratory report from the October 2004 through May 2005 sampling events. The most common QA/QC amendments to these reports were data qualifiers (for outlying QA/QC results) and estimated concentrations (for results initially reported as "Peak present below report level"). The amended reports issued by the MDH did not change the results, but added more detail.

7.12 WHY DID CRA RECOMMEND SWITCHING LABS IN FEBRUARY 2005?

During the October 2004 sampling, low concentrations of vinyl chloride were detected in water samples from two residential wells. When this type of detection occurs, it is standard protocol to re-sample the wells in order to confirm the analytical results. This re-sampling was performed in January 2005, and it also resulted in the detection of vinyl chloride in the same two wells. Because the same laboratory (Interpoll Laboratories, Inc.) had run the tests that resulted in the two detections, CRA recommended that a second lab (Severn Trent Laboratories) be used to provide independent verification of the presence of vinyl chloride. The MPCA approved this recommendation. In addition, to provide another point of comparison, the MPCA decided to collect split samples and to have those samples analyzed by the MDH. In February 2005, the same two wells were sampled again by both CRA and the MPCA with analysis by their respective labs, Severn Trent Laboratories (STL) and MDH. Below is a comparison of the vinyl chloride data:

Date	***Sampler***	***Lab***	***12 West Shore***	***13 West Shore***
October, 2004	CRA	Interpoll	0.12 µg/L	0.12 µg/L
January, 2005	CRA	Interpoll	0.12 µg/L	0.16 µg/L
February, 2005	MPCA	MDH	0.15 µg/L	0.11 µg/L
February, 2005	CRA	STL	< 0.16 µg/L	<0.16 µg/L

As shown, in February the STL detection limit was 0.16 µg/L, which was slightly higher than the measured amounts by the MDH lab in February. As such, a value of "< 0.16 µg/L" is consistent with another lab that measured 0.15 µg/L in the same sampling round. Even though the STL lab did not detect vinyl chloride, the result of "< 0.16 µg/L" confirms that the measurement was below the HRL.

MDH, Interpoll Laboratories, Inc. (Interpoll), and STL are the three State-certified independent labs that analyze drinking water using the required analytical methods. As the above chart demonstrates, consistent results were obtained regardless of sampling personnel or laboratory used. The consistency of these results has helped to assure the MPCA and CRA that the sample results were valid.

7.13 WHAT ARE THE RESPECTIVE ROLES AND RESPONSIBILITIES OF THE MPCA AND OF REYNOLDS AND WHIRLPOOL?

All work related to the Highway 96 Site is conducted by Whirlpool and Reynolds under a Consent Order with the MPCA, which the parties entered into pursuant to the Minnesota Environmental Response and Liability Act ("MERLA" or the state Superfund statute) and which is consistent with all Minnesota environmental laws and regulations. As is the case with all other state Superfund sites (which is modeled after the federal Superfund Law), Whirlpool and Reynolds do not undertake any work related to the site without the prior approval of the MPCA and all work is conducted under the MPCA's supervision and authority. The MPCA staff members are trained professionals in the environmental field and have the expertise to independently evaluate the work performed by Whirlpool and Reynolds.

7.14 WHAT STEPS HAVE BEEN TAKEN TO KEEP THE COMMUNITY AND AFFECTED RESIDENTS INFORMED OF DEVELOPMENTS?

In July 1993, a fact sheet was provided to the community that presented the proposed remedy for the Highway 96 Site. A public meeting was held to discuss the proposed remedy on August 24, 1993. Public comments were received by the MPCA throughout the summer of 1993. The MPCA mailed out its Minnesota Decision Document (MDD) to the residents along with a responsiveness summary that provided answers to questions posed by the community. Comments on the proposed plan were received from residents located on Buffalo Road, Eagle Ridge Road, East Oaks Road, Sparrow Lane and Sunset Lane, which indicates that many residents located west of Gilfillan Lake were aware of the Highway 96 Site.

Since 1993, CRA has prepared an annual monitoring report for the MPCA describing the results of each monitoring round for the residential wells located in North Oaks.

Sampling results for each residential well were provided in a letter to each home owner for sampling rounds conducted from 1993 through 2004.

After the October 2004 detections of vinyl chloride, the MPCA provided a fact sheet to the residents located on the west shore of Gilfillan Lake. Other efforts to keep the community informed of important developments have included the following:

- Community meeting on March 28, 2005;
- North Oaks Council meeting on May 12, 2005;
- North Oaks Council meeting on May 19, 2005;
- Technical meeting among representatives of the MPCA, Reynolds, Whirlpool, CRA, and residents; and
- Posting of information and periodic updates on the City of North Oaks website.

7.15 HOW CAN WE BE SURE THAT SAMPLING IS BEING UNDERTAKEN PROPERLY?

The sampling of residential wells in North Oaks is being performed in accordance with the MPCA's Groundwater Sampling Guidance Document, which is consistent with USEPA protocols. CRA follows the protocols established by this guidance document.

7.16 WHY WEREN'T EXTRACTION WELLS INSTALLED IN THE AREA EAST OF GILFILLAN LAKE IN 1993?

This issue is discussed within the MPCA's MDD. In the MDD, the MPCA provides responses to public comments. The following comment and MPCA response identify the MPCA's rationale for not installing extraction wells in 1993.

10. Public Comment #10 (from 1993): *The single groundwater extraction well provided for in the remedy does not provide adequate source control. It also does not remediate the plume that is impacting the residential wells--why not? Multiple extraction wells should be used.*

MPCA Response: *Analytical evidence to date suggests the extraction well installed in 1989 is in fact doing what it is designed to do; that is preventing further migration of contaminants away from the dump site. VOC concentrations being measured in downgradient monitoring wells and neighboring residential wells have decreased since the system began operating. In the case of vinyl chloride, it was not detectable at this low a level until recently, and we cannot say*

that it either has or has not been following the same trend. (Vinyl chloride can also appear as an end product of degradation of other VOCs.) Downgradient monitoring wells will continue to be monitored to ensure the system is continuing to be effective.

The plume that's affecting the residences is referred to as a "remnant" plume, and probably always was beyond the capture zone of the extraction system. Because the extraction system effectively cuts off the source, the remnant plume will slowly move out of the area and eventually dissipate. Attempting to recover this plume would not be practical, as it is already too large and dilute. Additional extraction wells may be considered if significant groundwater contamination is found at or near the south disposal area.

TABLE 7.1

MINNESOTA HEALTH RISK LIMITS (HRLs)
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

Chemical Name	***HRL***
Chloroform	60 µg / L
1,1-Dichloroethane	70 µg / L
cis-1,2-Dichloroethylene	70 µg / L
Methylene chloride (Dichloromethane)	50 µg / L
Methyl ethyl ketone (MEK, 2-butanone)	4,000 µg / L
Vinyl chloride	0.2 µg / L

TABLE 7.2

SUMMARY OF ENFORCEABLE VINYL CHLORIDE STANDARDS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

State/Country	***Vinyl Chloride Standard***	***Units***
Alabama	2	µg/L
Arkansas	2	µg/L
Australia	0.3	µg/L
California	0.5	µg/L
Canada	0.5 - 2	µg/L
Connecticut	2	µg/L
European Union	0.5	µg/L
Florida	1	µg/L
Georgia	2	µg/L
Illinois	2	µg/L
Indiana	2	µg/L
Iowa	2	µg/L
Kentucky	2	µg/L
Louisiana	2	µg/L
Maine	2	µg/L
Massachusetts	2	µg/L
Michigan	2	µg/L
Minnesota	0.2 - 2	µg/L
Mississippi	2	µg/L
Missouri	2	µg/L
New Hampshire	2	µg/L
New Jersey	2	µg/L
New Mexico	2	µg/L
New York State	2	µg/L

TABLE 7.2

SUMMARY OF ENFORCEABLE VINYL CHLORIDE STANDARDS
HIGHWAY 96 SITE
WHITE BEAR TOWNSHIP, MINNESOTA

State/Country	***Vinyl Chloride Standard***	***Units***
North Carolina	2	µg/L
North Dakota	2	µg/L
Ohio	2	µg/L
Oklahoma	2	µg/L
Pennsylvania	2	µg/L
Rhode Island	2	µg/L
South Carolina	2	µg/L
South Dakota	2	µg/L
Tennessee	2	µg/L
Texas	2	µg/L
Vermont	2	µg/L
West Virginia	2	µg/L
Wisconsin	0.2	µg/L
World Health Organization	0.3	µg/L

Note:
Deatailed information regarding the standards listed in this table can be found in Appendix F.

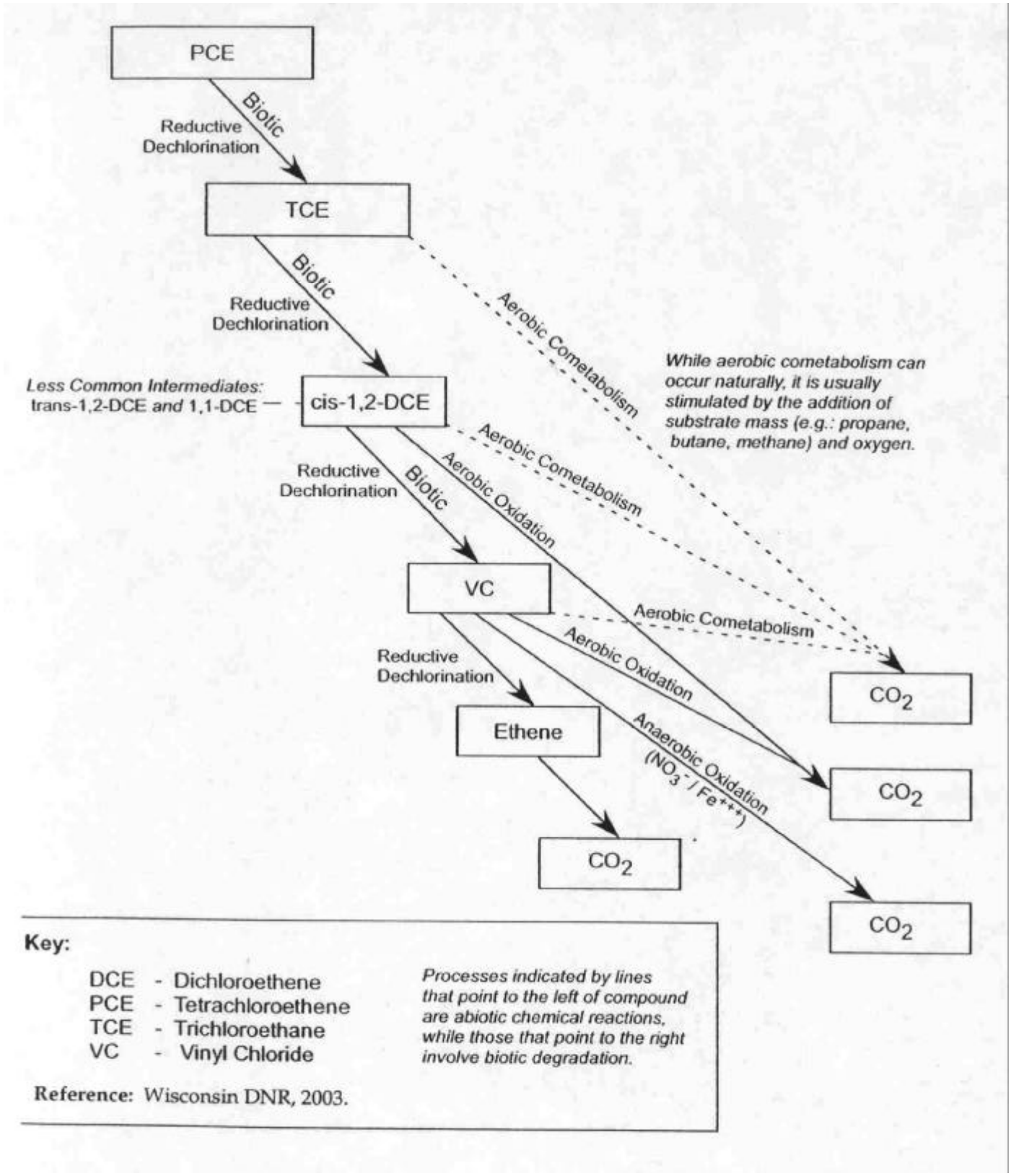

figure 7.1

PCE AND TCE
BIODEGRADATION PROCESS
North Oaks, Minnesota