

APPENDIX B

**TECHNICAL MEMORANDUM -
AIR EMISSIONS EVALUATION**



TECHNICAL MEMORANDUM

TO: Brian Sandberg
FROM: Shawn Horn *SH*
C.C.: Sarah Illi; CRA
REF. NO.: 2012
DATE: June 25, 2007
RE: Air Emissions Evaluation
Ski Lane Ravine Area Treatment
North Oaks, Minnesota

INTRODUCTION

This document evaluates the potential air emission impact from the proposed treatment of vinyl chloride in groundwater using spray nozzle aeration inside a manhole in the Ski Lane Ravine area of North Oaks, Minnesota.

PROPOSED TREATMENT SYSTEM

The proposed system will treat groundwater at a maximum flow rate of 40 gallons per minute (gpm) containing a maximum vinyl chloride concentration of 0.2 µg/L. The water will be nozzle-sprayed in to a manhole. A blower capable of producing at least 100 cubic feet per minute (cfm) will be used to provide a fresh supply of air into the manhole and volatilize the vinyl chloride. The blower will be housed in a pumphouse near the manhole. Air from the manhole will be vented through a 10 foot tall, 4 inch diameter stack that will run up the side of the pumphouse.

AIR MODELING

To estimate the maximum concentration of vinyl chloride in air that a potential receptor may be exposed to as a result of the proposed treatment system, the United States Environmental Protection Agency (USEPA) SCREEN3 air model was used to produce a widely accepted conservative estimate. The following scenario was evaluated for possible emissions:

- Stack Height - 10 feet
- Stack Diameter - 4 inches
- Air contaminant emission rate : 1 gram/second
- Air Flow - 100 cubic feet per minute
- Air Temp - 68°F
- Urban Area

- Building downwash considered (8 foot x 8 foot building frame, 8 feet high)

Building downwash considers the downwind effects from building structures where downward turbulent effects can occur thereby increasing predicted chemical concentrations. The Screen3 modeling output is provided in Attachment 1.

RESULTS

As shown in Attachment 1, at a 1 gram per second contaminant emission rate, the maximum 1-hour air concentration of 21370 $\mu\text{g}/\text{m}^3$ occurs using Scenario 2, at a distance of 5 meters (16.4 feet) from the stack. Since the ratio of emission rate to maximum air concentration is linear, the maximum Screen3 air concentration can be used to calculate the maximum vinyl chloride air concentrations for the treatment system based upon the groundwater extraction rate and vinyl chloride groundwater concentration. As such, the estimated maximum vinyl chloride emission rate from the stack is 0.0000005 grams per second (0.2 $\mu\text{g}/\text{L}$ at 40 gpm). Using this corrected emission rate, a maximum vinyl chloride air concentration of 0.011 $\mu\text{g}/\text{m}^3$ results (21370×0.0000005).

Minnesota Rules, Chapter 4717.8100 has established a chronic health risk value (HRV) for vinyl chloride in air of 1 $\mu\text{g}/\text{m}^3$. A chronic HRV is defined by Minnesota Rules, Chapter 4717.8050 (8) as *"the concentration of a chemical or defined mixture of chemicals in ambient air, at or below which the chemical or defined mixture of chemicals is unlikely to cause an adverse health effect to the general public when exposure occurs daily throughout a person's lifetime."*

Hence, the estimated maximum 1-hour vinyl chloride air concentration from the proposed treatment system is approximately two orders of magnitude below the chronic HRV.

JE/ma/26

Enc.

ATTACHMENT A
SCREEN3 DATA SHEETS

*** REGULATORY (Default) ***
 PERFORMING CAVITY CALCULATIONS
 WITH ORIGINAL SCREEN CAVITY MODEL
 (BRODE, 1988)

*** CAVITY CALCULATION - 1 ***

CONC (UG/M**3) = .2137E+05
 CRIT WS @10M (M/S) = 5.94
 CRIT WS @ HS (M/S) = 5.94
 DILUTION WS (M/S) = 2.97
 CAVITY HT (M) = 3.21
 CAVITY LENGTH (M) = 5.01
 ALONGWIND DIM (M) = 3.05

*** CAVITY CALCULATION - 2 ***

CONC (UG/M**3) = .0000
 CRIT WS @10M (M/S) = 99.99
 CRIT WS @ HS (M/S) = 99.99
 DILUTION WS (M/S) = 99.99
 CAVITY HT (M) = 2.83
 CAVITY LENGTH (M) = 2.87
 ALONGWIND DIM (M) = 4.31

CAVITY CONC NOT CALCULATED FOR CRIT WS > 20.0 M/S. CONC SET = 0.0

END OF CAVITY CALCULATIONS

*** SUMMARY OF SCREEN MODEL RESULTS ***

CALCULATION PROCEDURE	MAX CONC (UG/M**3)	DIST TO MAX (M)	TERRAIN HT (M)
----- SIMPLE TERRAIN	.2083E+05	11.	0.
BLDG. CAVITY-1 LENGTH)	.2137E+05	5.	-- (DIST = CAVITY
BLDG. CAVITY-2 LENGTH)	.0000	3.	-- (DIST = CAVITY

** REMEMBER TO INCLUDE BACKGROUND CONCENTRATIONS **
