SHEET NO. 1 OF 3
PROJECT NO. 02751.16
DATE 10/19/11
BY S. Metz
CHK'D C. Linford

TRC

SUBJECT TPC - Passive Vent Emissions

Estimated Ventilation Rate:

- Passive Vents rated for flow of 126 ft^3/min @ 4 mile/hr wind
  Assume a reasonable average flow rate of 126 ft^3/min

$$\frac{126\ ft^3/min}{vent} \times 15\ vents = 1890\ ft^3/min$$

$$= 53.5\ m^3/min$$

Per R336.1290 Permit to install exemptions; emission units w/ limited emissions

Rule 290 (a) → the requirement to obtain a permit to install does not apply if the emission unit meets any of the following criteria:

Rule 290 (a)(ii) → Any emission that total uncontrolled or controlled emission of air contaminants are not more than 1000 or 500 pounds per month, respectively and all of the following criteria are met:

(A) Non-carcinogenic → NA
(B) Non-carcinogenic → NA
(C) For carcinogenic air contaminants w/ initial risk screening levels greater than or equal to 0.04 $\mu g/m^3$ the uncontrolled or controlled emissions shall not exceed 20 or 10 pounds per month, respectively
(D) ozone → NA

As per Rule 290 (a)(ii)(C) the system cannot emit more than 20 lbs of a carcinogenic VOC per month

$$20\ lbs/month = \frac{9.1 \times 10^9\ \mu g}{43800\ minutes} = 2.1 \times 10^5\ \mu g/min$$

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SHEET NO. 2 OF 3
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SUBJECT TPC - Passive Vent Emissions

Given an estimated average flow rate of 53.5 m^3/min

and a maximum total carcinogenic VOC emission of 2.1×10^5 µg/min

The ~~maximum~~ sum average emission concentration must be less than or equal to

$$\frac{2.1 \times 10^5 \ \mu g/min}{53.5 \ m^3/min} = \boxed{3870 \ \mu g/m^3}$$

The ~~groundwater~~ darcy sum velocity (q) of groundwater ~~at~~ sum in the vicinity of the PRB is estimated below

$q = ki$ where k = hydraulic conductivity, and
i = gradient

~~q =~~ sum k = average hydraulic conductivity measured at PRB wells sammed in native soil
$= 3.53 \times 10^{-3}$ cm/s

i = average gradient measured across trench PRB wells
$= 0.002$

$q = 7.06 \times 10^{-6}$ cm/s $= 4.24 \times 10^{-4}$ cm/min $= 18.6$ cm/month
$= 0.186$ m/month

Barrier length = 700 ft = 213 meters

Conservatively assume that VOCs in upper 10 cm of the aquifer are completely volitized into soil gas

$\therefore (0.186 \ m/month)(213 \ m)(0.1 \ m) = 4.0 \ m^3/month$

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SHEET NO. 3 OF 3
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TRC

SUBJECT TPL- Passive Vent Emissions

The VOCs from approximately 4 m^3 of Groundwater may be ~~converted~~ SEM volatilized into the soil gas and vented through the passive PRB ventilation system

Given that emissions must be ≤ 20 lbs or 9.1×10^9 µg / month

The maximum allowable concentration in this GW is calculated below

$$\frac{9.1 \times 10^{+9} \ \mu g \ VOC}{4.0 \ m^3 \ Groundwater} \times \frac{1 m^3}{1000 \ L} = 2.3 \times 10^6 \ \mu g/L \ VOC \text{ in Groundwater}$$

The maximum observed concentrations of COC treated by the PRB are on the order of 5000 µg/L

COCs cannot degrade such that degradation products are produced at concentrations orders of magnitude above the concentration of the parent product in the groundwater

The proposed passive vent system is ~~exe~~ SEM exempt from the requirement for a permit to install under Rule 290

~~Methane emissions are~~ SEM

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