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EVALUATION OF THE AIR QUALITY IMPACTS OF THE PROPOSED PLAN FOR ADDITIONAL LAGOON AREA REMEDIATION AT BRAULT LAGOON SITE

September 1990

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October 31, 1990

Albert M. Bronson, Esq.
Assistant Attorney General
New York State Department of Law
Environmental Protection Bureau
Justice Building, Room 243
Empire State Plaza
Albany, New York 12224

Re: Harris Corporation -- Evaluation of the Air Quality Impacts of the Proposed Plan for Additional Lagoon Area Remediation at Brault Lagoon Site, September, 1990

Dear Mr. Bronson:

Enclosed please find one copy of the above-referenced report. Two additional copies have been sent directly to Dan Steenberge.

In your letter dated August 21, 1990, the State of New York approved of Harris' June, 1990 proposal described in a report entitled: Evaluation of the Groundwater Remediation System and Proposed Plan for Additional Lagoon Area Remediation at Brault Lagoon Site. The approval was conditioned on three conditions. The enclosed report demonstrates that the plan will meet these conditions.

If you have any questions regarding the report, please do not hesitate to call.

Sincerely,

Kevin M. Young

Enclosure
cc: Dan Steenberge (w/enclosures)
Stuart Bassell (w/o enclosure)
David Bock (w/o enclosure)

014-842-vln

INTRODUCTION

In June 1990 Lawler, Matusky & Skelly Engineers (LMS) prepared *Evaluation of the Groundwater Remediation System and Proposed Plan for Additional Lagoon Area Remediation at Brault Lagoon Site*. This document described the degree to which the groundwater remediation system was achieving its objectives. Based on this evaluation, two additional remedial activities were proposed in the report:

- Additional groundwater recovery wells, probably three, should be installed in the lagoon area to contain VOCs closer to their source. The actual number of wells that will eventually be operational cannot be determined until these additional wells have been constructed and pump tested.

- The remaining sediments beneath the lagoon should be excavated, spread in the vicinity of PW-11 and tilled so as to air strip any residual VOCs from that soil.

In its letter dated 21 August 1990, the New York State Department of Law conditionally approved the proposal, provided that the following three conditions were met:

"1. The air stripping tower must treat the additional flow to the standards expressed in the Consent Judgment.

2. The increased contaminant load to the air stripper must be within permissible limits; and

3. The discharge to the air from the lagoon sediments will be within permissible limits."

The purpose of this document is to demonstrate that the plan will meet these conditions, each of which is separately assessed below. For this demonstration, LMS has used conservative assumptions to perform screening-level analyses. These analyses show that each of the foregoing conditions are satisfied. As a result, more refined analyses are not necessary.

1. TREATMENT OF ADDITIONAL FLOW

Influent VOC and hydraulic loads to the air stripping tower for the last two years are summarized below:

	CONCENTRATION (ug/l)			FLOW (gal/min)
	1,1,1-TCE	1,1-DCE	1,1-DCY	
Jul 1990	88	180	56	115
Apr 1990	2100	140	41	80
Jan 1990	1000	150	40	115
Oct 1989	1200	190	<10	100
Jul 1989	1200	180	75	100
Apr 1989[a]	1600	210	71	115
Jan 1989	1000	140	58	86
Oct 1988	240	320	70	80

[a]Also 31 ug/l xylenes and 14 ug/l tetrachloroethylene.

The conservatively high estimate of a possible future load, below, is based on the highest influent concentrations for any VOC and highest hydraulic load observed during this two-year period:

	CHEMICAL		
	1,1,1-TCE	1,1-DCE	1,1-DCY
Concentration (ug/l)	2100	320	70
Load at 115 gal/min (lb/hr)	0.12	0.02	0.004

It is anticipated that the new lagoon area wells will result in an additional load to the treatment system comparable to that now produced by PW-11. The recent chemical and yield data for PW-11 are summarized below:

	CONCENTRATION (ug/l)						
	1,1,1-TCE	1,1-DCE	1,1-DCY	1,2-DCE	TCY	XYLENES	FLOW (gal/min)
Apr 1990[a]	31,000	130	130	36	22	<30	5.7
Oct 1989	16,000	<100	<100	<100	<100	<300	1.1
Jul 1989	13,000	20	16	<10	<10	<30	8.0
Apr 1989	16,000	<100	<100	<100	<100	310	5.1
Jan 1989	30,000	86	140	27	21	240	3.5

[a]Also dibromochloromethane 58 ug/l.

The conservatively high estimate of the possible future load produced by PW-11 provided below is based on the highest influent concentrations observed for any chemical and the highest hydraulic load:

	CHEMICAL					
	1,1,1-TCE	1,1-DCE	1,1-DCY	1,2-DCE	TCY	XYLENES
Concentration (ug/l)	31,000	130	140	36	22	310
Load at 8 gal/min (lb/hr)	0.12	0.0005	0.0006	0.0001	0.0001	0.0012

It is conservatively assumed that the three additional recovery wells in the lagoon area will each produce 8 gal/min, for a total lagoon area production (including PW-11) of 32 gal/min. However, is unlikely that such a yield can actually be sustained.

The lagoon area recycle, although currently inactive, may increase the load by an additional 10 gal/min. The possible future load to the tower with the additional recovery wells and recycle is calculated as follows:

	LOAD (lb/hr)[a]			FLOW
	1,1,1-TCE	1,1-DCE	1,1-DCY	(gal/min)
Present possible	0.12	0.02	0.004	115
Additional pump wells	0.36	-	-	24
Recycle	0.15	-	-	10
Total Possible	0.63	0.02	0.004	149

[a]Ignore small loads from 1,2-DCE, TCY, and xylenes.

The possible concentrations for the target compounds in the tower influent are as follows:

COMPOUND	CONCENTRATION (ug/l)
1,1,1-TCE	8,500
1,1-DCE	270
1,1-DCY	50

The additional lagoon area pumpage will increase the influent concentration of 1,1,1-TCE by about five times and reduce the concentrations for 1,1-DCE and 1,1-DCY by about 15%.

Past computer modeling by Hydrogroup, the tower manufacturer, indicates that the tower will achieve the following removal efficiencies:

CHEMICAL	EFFICIENCY (%)[a]
1,1,1-TCE	99.94
1,1-DCE	99.86
1,1-DCY	99.96

[a]Calculated at 155 gal/min.

Except for a recent period when there was an iron buildup in the packing, the treatment system has been achieving its expected performance.

Based on the above efficiencies, the following concentrations can be expected in the treated effluent:

	CONCENTRATIONS (ug/l)	
CHEMICAL	EFFLUENT	LIMIT IN CONSENT JUDGMENT
1,1,1-TCE	5.0	500
1,1-DCE	0.4	50
1,1-DCY	0.1	50

The above tabulation indicates that the treatment system will still be able to produce an effluent in compliance with the limitations expressed in the consent judgment.

2. INCREASED LOAD TO THE TOWER (AIR EMISSIONS)

As indicated previously, the proposed additional lagoon area remediation will increase the 1,1,1-TCE load to the tower by about a factor of 5 to 0.63 lb/hr. The increased load for other VOCs will be insignificant. 1,1,1-TCE is classified as a low-toxicity air contaminant in NYSDEC's Air Guide-1. The document requires that point sources with emission rate potentials in excess of 10 lb/hr be controlled by, for example scrubbing with activated carbon. The emission rate potential for 1,1,1-TCE is well below this threshold.

The air stripping tower vents horizontally to the northwest through a window centered 36 ft, 7 in. above the treatment building slab. The slab is raised 7 ft above the local ground surface to the northwest and 3 ft to the south. This configuration results in a minimum discharge height of 39 ft, 7 in, more than 50% higher than the top of any nearby structure. Downwash can therefore be ignored in evaluating the air quality impact from the emission.

Assuming there is no momentum or buoyancy associated with the emission, the effective stack height of the emission is 39 ft, 7 in. Figure V of Air Guide-1 indicates that a 1 lb/hr emission at this stack height will result in a worst-case annual concentration of approximately 1.4 ug/m^3. Because the possible 1,1,1-TCE emission is projected to be 0.63 lb/hr at most, the annual concentration will be 0.9 $\mu g/m^3$ far below the current ambient guidance concentration

(AGC) of 38,000 ug/m^3. The proposed concentration (September 1989 draft Air Guide-1) is 45,238 ug/l.

The projected 1,1-DCE concentration is 0.03 µg/m^3. There is no AGC for this chemical; the proposed guidance is 19,286 µg/m^3. The projected 1,1-DCY worst case annual concentration is 0.006 ug/m^3. The current AGC is 66.7 ug/m^3; the proposed concentration is 0.02 ug/m^3.

Based on these calculations, the emissions from the tower will remain within permissible limits if the lagoon area groundwater pumping system is expanded.

3. LAGOON SEDIMENTS

Available Chemical Data

Four sediment/sludge samples have been collected from Lagoon No. 1, one sample from Lagoon No. 2. The relevant information on these samples is summarized below.

On 7 July 1983 LMS collected a sample of sludge from Lagoon No. 1. The analytical results for VOCs are:

CHEMICAL	CONCENTRATION (mg/kg)
1,1,1-TCE	170,000
Toluene	8,100
Ethylbenzene	<1200 (Confirmed present)
1,1-DCE	<770
1,1-DCY	<470

The sludge in the lagoon was excavated between December 1983 and January 1984. Sediment samples were subsequently collected on 6 July 1984 by REWAI and tested for 1,1,1-TCE only:

	DEPTH (ft)	1,1,1-TCE CONCENTRATION (mg/kg)
Lagoon No. 1		
	0-1.0	63,000
	1.0-1.5	2,600
	1.5-2.0	1,200
Lagoon No. 2		
	0-2.0	500

Approximately 2-3 ft of sediment was excavated from the bottom of Lagoon No. 1 between December 1984 and January 1985. No postexcavation samples were collected, and the VOC concentrations in the remaining soils are not known with any certainty. However, observations made during the test pit digging conducted in August 1988 indicated that VOCs are present. For the purposes of this assessment, it is assumed that these concentrations are representative of the 1.5-2.0 ft sample collected in June 1984. As noted above, the 1,1,1-TCE concentration at that depth was 1200 mg/kg (0.12% 1,1,1-TCE). Based on the results of the 1983 sampling, it is assumed that the concentrations of any other VOCs possibly present are insignificantly low in comparison to the 1,1,1-TCE concentration. This is confirmed by the sampling results of the groundwater monitoring and pump test wells in the vicinity of the lagoons: MW-4(S), MW-1(S) and PW-11. 1,1,1-TCE accounts for 95-99% of the VOCs in the groundwater.

Accordingly, the amount of chemical (1,1,1-TCE) estimated to be present below the lagoon surface is estimated as follows:

Assumptions

1.	In-place volume of soil to be removed (from June 1990 LMS plan)	90 yd^3
2.	In-place density for sand	120 lb/ft^3
3.	1,1,1-TCE concentration (from above)	0.12%

Calculation

90 yd^3 x 120 lb/ft^3 x 27 ft^3/yd^3 x 0.12% = 350 lb

Projected Emissions

It is conservatively projected that 50% of the VOCs will be stripped during the one-week period when the lagoon soils are excavated, spread, and initially turned. Further assuming a 40-hr work week, the emission rate would be:

50% x 350 lb/40 hr = 4.5 lb/hr

Projected Air Quality

As indicated in the attached plate, the nearest receptor is the Sprague residence, located 1900 ft to the northeast along Route 22. To predict the impact upon air quality at this location, the procedures in the following reference were employed:

D. Bruce Turner. 1969. *Workbook of Atmospheric Dispersion Estimates.* U. S. Department of Health, Education and Welfare.
National Air Pollution Control Administration, Cincinnati, OH.

Equation 3.4 of the workbook allows the calculation of the downwind concentration for a ground-level source with no effective plume rise:

$$\chi\ (x) = \frac{Q}{\pi\ \sigma_y\ \sigma_z\ u}$$

where:

$\chi(x)$ = concentration (g/m^3) at a downwind distance x

Q = emission rate (g/sec)

$\sigma_{y,z}$ = dispersion coefficients for the horizontal (y) and vertical (z) planes

u = wind speed (m/sec)

Q is 4.5 lb/hr (0.6 g/sec) for this application. The values of the standard deviations are primarily dependent on the turbulent structure of the atmosphere, wind speed (u), and

downwind distance (x). The downwind distance is 1900 ft (580 m). The turbulent structure of the atmosphere and wind speed are considered by assigning a stability class to the meteorological conditions of concern.

There are six stability classes: A, B, C, D, E, and F. Stability Class A represents the least stable conditions for which dispersion is the greatest. Stability Class F represents the most stable conditions, which will result in the highest downwind concentrations from the air emission. The workbook indicates that Stability Class F will occur at night with a wind speed of 2-3 m/sec (4-7 mi/hr).

To provide a conservative estimate of the downwind impact, Stability Class F at 2 m/sec is used to calculate the dispersion coefficients needed for the above equations.

Figure 3-2 of the workbook provides the solution for the horizontal dispersion coefficient (21 m); Figure 3-3, the vertical dispersion coefficient (9.6 m). Accordingly, the concentration 1900 ft downwind is:

$$\frac{0.6 \text{ g/sec}}{3.14 \times 21 \text{ m} \times 9.6 \text{ m} \times 2 \text{ m/sec}}$$

$$= 0.0005 \text{ g/m}^3$$

$$= 500 \text{ ug/m}^3$$

The worst-case estimated concentration about 1% of the current ACG of 38,000 ug/m^3. Expected concentrations will be less. The emission rate during the excavation/spreading would have to increase to over 300 lb/hr before the receptor impacts might be unacceptable.