Olin CHEMICALS

P.O. BOX 248, 1186 LOWER RIVER ROAD NW, CHARLESTON, TN 37310
Phone: (615) 336-4000

February 3, 1997

Mr. James Craft
Engineering Geologist
New York State Department of Environmental Conservation
Region 8 Office - Division of Hazardous Waste Remediation
6274 East Avon - Lima Road
Avon, New York 14414-9519

Re: Olin Rochester RI/FS Quarterly Report No. 13
Olin Chemicals (Site #628018a) 100 McKee Rd, Rochester, NY

Dear Mr. Craft:

This is the thirteenth quarterly report of progress on the Olin Rochester RI/FS, covering the period from October 1, 1996 through December 31, 1996.

Barge Canal sampling:

Attached are canal surface water sampling results from the third and fourth quarters of 1996. The results continue indicate low level (J) detections below the practical quantitation limit. The data are consistent with prior observations that detections occur farther south (conventional downstream direction) during high canal stage and farther north during low canal stage, when there is possible flow reversal.

The fourth quarter sampling included additional canal sampling points, extending the line of points to the north and to the south. The objective of these added points is to define the limit and extent of any canal detections. The southernmost sampling points confirmed the absence of pyridine detections, but the northernmost point still showed J-level detection of chloropyridines. Olin will continue to add additional upstream sampling points at the next (first quarter-97) sampling to define the limit and extent of chloropyridine detections in surface water.

The point of origin for chloropyridine detections is apparently the quarry outfall to the barge canal. The most recent sampling results showed consistent detections only to the north of the outfall.

The quarry outfall was sampled directly and showed detections of chloropyridines ranging from 26 to 92 micrograms per liter (ug/l). However, canal water samples were taken 100 feet north, 200 feet north, 100 feet south and 200 feet south of the quarry outfall to estimate dilution effects. The analytical results for these samples showed a maximum concentration of 3 ug/l (J), indicating that there is rapid dilution immediately adjacent to the location at which the quarry outfall enters the barge canal. Olin will continue to sample near the outfall to monitor this trend.

Human Health Risk Evaluation:

Olin worked with NYSDEC, the New York State Department of Health and the Monroe County Department of Health to determine whether the detected levels of chloropyridines in the barge canal present any risk to human health. Olin and our consultants, ABB Environmental Services, discussed health risk issues and concerns with the above-noted agencies and subsequently developed the Phase II Remedial Investigation Supplemental Human Health Risk Evaluation for the Erie Barge Canal.

This report established risk based concentrations (RBC's) for various exposure pathways (swimming, fish ingestion) and evaluated whether unacceptable risk could be posed by the actual detected levels of chloropyridines. The report also included a method study for chloropyridine analyses to assist in developing risk based concentrations for each pyridine compound.

The report also included a sensitivity analysis, which describes the range of uncertainty and the conservatism of exposure assumptions that are used to calculate risk. The report states *"Comparison of quarry outfall water concentrations to RBC's that are based on the most stringent exposure conditions represents an extremely conservative evaluation of potential risks. Only the maximum concentrations of 2,6-dichloropyridine and 2-chloropyridine, which are represented by the data for the quarry outfall water, exceed RBC's. The RBC's exceeded are those based on maximum exposure conditions for the 1x10 -6 cancer risk level; RBC's based on average exposure conditions or non-cancer effects are not exceeded."* Thus, risk threshold levels are not exceeded by detected levels of barge canal water for nearly all scenario's. Only the maximum concentration detected at the quarry outfall, coupled with the maximum exposure conditions, would exceed RBC's. While this condition of exposure exceedence is highly unlikely, Olin continues to monitor surface water and quarry water and to plan appropriate remediation.

While the Human Health Risk Evaluation report has been submitted previously, a copy of the report is attached so that quarterly reports can continue to be the reference for the progress of the RI/FS.

Offsite Groundwater:

Olin has obtained drilling access and has installed two well clusters south of the quarry. Each of these well clusters screens both the upper and lower fractured bedrock. The wells were installed to determine whether any groundwater contamination was bypassing the quarry. The wells were installed and sampled in November, 1996. Maximum chloropyridine levels detected in any well ranged from 34 to 120 ug/l, i.e. one to two orders of magnitude lower than the concentrations detected in the quarry seep. Since groundwater discharges to the quarry from areas proximate to it, these data indicate that it is likely that the offsite plume is discharging to the quarry and that the dispersive plume edge is being detected adjacent to the quarry. Further monitoring will determine whether or not the discharge fate of the entire plume is into the quarry. A data table is attached, showing quarry well groundwater analytical results.

Building on these results, Olin is currently drilling additional wells at locations shown on the attached map, to define a "clean zone" to the south of the known offsite plume. After defining the "clean zone", Olin will have determined the limits and likely fate of offsite groundwater contamination and can proceed with development of an offsite FS. The additional wells are to be located on quarry property and at the Pfaudler property south of Olin and east of the quarry. The quarry wells monitor the deep bedrock fracture zone, since it is the probable groundwater pathway past the barge canal. The Pfaudler property wells, located on the source-side of the barge canal, monitor both the upper and lower bedrock fracture zones.

Olin plans to conduct the first semiannual 1997 groundwater sampling on the wells listed in the previous (12th) quarterly report. As part of that sampling effort, we would like to re-sample selected wells at the Chevron site, which lies between the Olin plant and the quarry, to better define the plume pathway between Olin and the quarry. We propose to sample at the base of these open-core wells using recently developed low-flow sampling methodology, which would provide better field-method assurance of the validity of any non-detect or detected concentrations.

Piezometric plots are attached for the third and fourth quarter monitoring events for 1996.

Community Relations:
Olin has continued to update our Community Advisory Panel on offsite investigative issues and results.

In January, 1997 Olin has published an update summary of groundwater and barge canal findings, including the Human Health Risk Evaluation described above, in our plant community newsletter, the Echo.

Mr. Charles Harrison has assumed responsibility as Olin's Rochester plant manager, and will lead the team of professionals that manages the environmental investigation at the site. John Kranjc, who has been the Rochester plant manager and who has directed the site team, has assumed the position of plant manager at Olin's plant in Charleston, Tennessee.

Olin will continue to communicate progress and issues with NYSDEC. Please direct any questions to me at 423 / 336-4587.

Sincerely,

Michael J. Bellotti

Michael J. Bellotti
Olin Corporation

Attachment

List of Attachments:

- Barge Canal surface water sampling results: Third and Fourth Quarters - 1996.
- Phase II Remedial Investigation Supplemental Human Health Risk Evaluation
- Quarry Wells' Groundwater analytical results: summary table
- New offsite well locations
- Piezometric plots: Overburden and Bedrock aquifers: Third and Fourth Quarters - 1996

cc:
Mr. Joseph Ryan
New York State Department of Environmental Conservation
Division of Environmental Enforcement
600 Delaware Avenue
Buffalo, New York 14202-1073

Mr. Joseph White
New York State Department of Environmental Conservation
Division of Hazardous Waste Remediation
50 Wolf Road
Albany, New York 12433-1010

Mr. Steven Shost
New York State Department of Health
Bureau of Environmental Exposure Investigation
2 University Place
Albany, New York 12203

Mr. Charles Harrison: Olin Rochester, NY
Mr. William Norman: Olin Rochester, NY
Ms. Laura Tew: Olin Charleston, TN
Ms. Brenda Zona: Olin Norwalk , CT
Mr. John Burns: Olin Charleston, TN
Ms. Monica L. Fries Esq.: Husch & Eppenberger, St. Louis, MO
Mr. Thomas Eschner: ABB, Portland, ME

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December 18, 1996

Mr. Michael Bellotti
Olin Chemical Corporation
P.O. Box 248, Lower River Road
Charleston, TN 37310

Subject: **Olin Rochester Site - Third Quarter 1996 Erie Barge Canal Water and Quarry Sampling Results**

Dear Mr. Bellotti:

This letter presents the results of chemical analysis and describes the sampling, analytical methodology, and analytical quality control for sampling conducted in September 1996 as follow up to the Phase II Remedial Investigation. Sampling results are enclosed for third quarter 1996 surface-water samples collected from the Erie Barge Canal (Canal) and the Dolomite Products Company quarry (quarry) as part of the on-going quarterly monitoring program for the Olin Rochester site are enclosed.

Sampling

Canal water samples and quarry surface-water samples were collected for selected pyridine analysis on September 27, 1996 and September 25, 1996, respectively. Two quarry samples were also analyzed for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). Twelve canal samples, including quality control samples, were collected from the established eight surface-water locations along the Barge Canal:

- SW-1
- SW-2
- SW-2 FD (field duplicate)
- SW-3
- SW-3 Matrix Spike
- SW-3 Matrix Spike Duplicate
- SW-4
- SW-5
- SW-6
- SW-7
- SW-8
- Bailer Rinse Blank

ABB Environmental Services, Inc.

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Portland, Maine 04112-7050
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ASEA BROWN BOVERI

outfall discharge location, QO-2. No other selected pyridines were observed in the other seven Canal surface water samples.

Quarry monitoring results indicated the presence of the selected pyridines in all six quarry samples. Consistent with results from previous monitoring events, the seep surface water sample collected from QS-4 and the quarry pond sample collected from QP-2 showed the highest selected pyridine results. VOCs and SVOCs were not detected in the quarry pond sample, QP-2; however, estimated concentrations (below the practical quantitation limit) of two VOCs and two SVOCs were detected in the quarry seep sample (QS-4): benzene (4 J µg/L); chlorobenzene (7 J µg/L); 1,2-dichlorobenzene (1 J µg/L); and butyl benzyl phthalate (0.4 J µg/L).

The results from the Canal and quarry September monitoring event are summarized below; all results are expressed in µg/L.

Sample Id	2-CPYR	3-CPYR	2,6-DCPYR	p-fluoroaniline	VOCs	SVOCs
SW-1	ND	ND	ND	ND	NA	NA
SW-2	ND	ND	ND	ND	NA	NA
SW-2 FD	ND	ND	ND	ND	NA	NA
SW-3	ND	ND	ND	R	NA	NA
SW-4	**0.3 J**	ND	ND	ND	NA	NA
SW-5	ND	ND	ND	ND	NA	NA
SW-6	ND	ND	ND	ND	NA	NA
SW-7	ND	ND	ND	ND	NA	NA
SW-8	ND	ND	ND	ND	NA	NA
QO-2	**92 D**	**6 J**	**24**	ND	NA	NA
QP-2	**150 D**	**8 J**	**38**	ND	ND	ND
QP-3	**110 D**	**6 J**	**33**	ND	NA	NA
QP-4	**5 J**	ND	**0.6 J**	ND	NA	NA
QP-5	**10**	ND	**2 J**	ND	NA	NA
QS-4	**2800 D**	**72 D**	**550 DJ**	**2 J**	**< 10***	**< 10***

J = Estimated value below reporting limit, but greater than zero.
ND = Not Detected
D = Value obtained from a dilution
R = Rejected value, quality control result(s) associated with the sample was grossly exceeded.
2-CPYR = 2-chloropyridine
3-CPYR = 3-chloropyridine
2,6-DCPYR = 2,6-dichloropyridine
FD = Field Duplicate
NA = Not Analyzed
<10* = VOC and/or SVOC detected, however, Individual chemical detected was <10 µg/L

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Quality Control

As part of the Canal water sampling program, one bailer rinse blank sample, one matrix spike/matrix spike duplicate (MS/MSD) sample, and one field duplicate sample was collected as quality control samples during the course of the September 1996 field event. All analytical holding times were met, and no target compounds were reported in the bailer rinse blank. Field duplicate precision was not calculated because pyridines were not detected in either the original sample or the field duplicate sample. With the exception of p-fluoroaniline, MS/MSD accuracy and precision criteria were met. p-Fluoraniline percent recovery for both the MS and MSD was less than the lower QC limit of 10 percent, therefore, the non-detected p-fluoroaniline result for SW-3 was qualified as rejected (result flagged with a R).

As part of the quarry sampling program, several samples required dilution due to the high concentration of 2-chloropyridine, 2,6-dichloropyridine, and/or 3-chloropyridine. QC samples collected during this sampling program included a trip blank, and one MS/MSD sample pair. All analytical holding times were met, and no target VOCs were reported in the trip blank. The majority of MS/MSD accuracy and precision criteria were met. Upper MS/MSD QC limits were slightly exceeded for a few compounds; however, these compounds were not detected in the native sample. Therefore, it is not anticipated that this occurrence has any impact on the results.

Conclusions

Results from the third quarter 1996 canal surface water sampling program indicated the presence of a trace concentration (detected below the reporting limit, but above zero) of 2-chloropyridine in only one of eight surface water samples collected from established sampling locations along the canal (SW-4). This monitoring point is located immediately downstream of the quarry discharge outfall location, QO-2 (see Attachment 1A).

The absence of selected pyridine concentrations in the samples collected as part of the third quarter 1996 monitoring program indicate a decrease in concentrations as compared with first and second quarter 1996 results.

The lower concentrations of chloropyridines reported in the Canal surface water samples collected during the second and third quarters of 1996 indicate that elevated pyridine concentrations reported in first quarter results may be related to seasonal low water levels in the Erie Barge Canal.

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The selected chloropyridine results for the September 1996 quarry pond samples QP-2, QP-3, QP-4 and QP-5 indicate a general consistency between the first, second, and third quarter sampling events in the nature and quantity of chloropyridine compounds reported in quarry pond surface-water. Concentrations of selected pyridines in the quarry seep sample (QS-4) are generally consistent with those observed during the second quarter 1996 event. Consistent with results from previous monitoring events, the seep surface water sample collected from QS-4 and the quarry pond sample collected from QP-2 showed the highest concentrations of selected pyridines. Quarry outfall (QO-2) results observed this quarter were also consistent with second quarter 1996 results in both the nature and quantity of selected pyridines.

Please call if you have any questions or comments on the material described in this letter.

Sincerely,

ABB ENVIRONMENTAL SERVICES, INC.

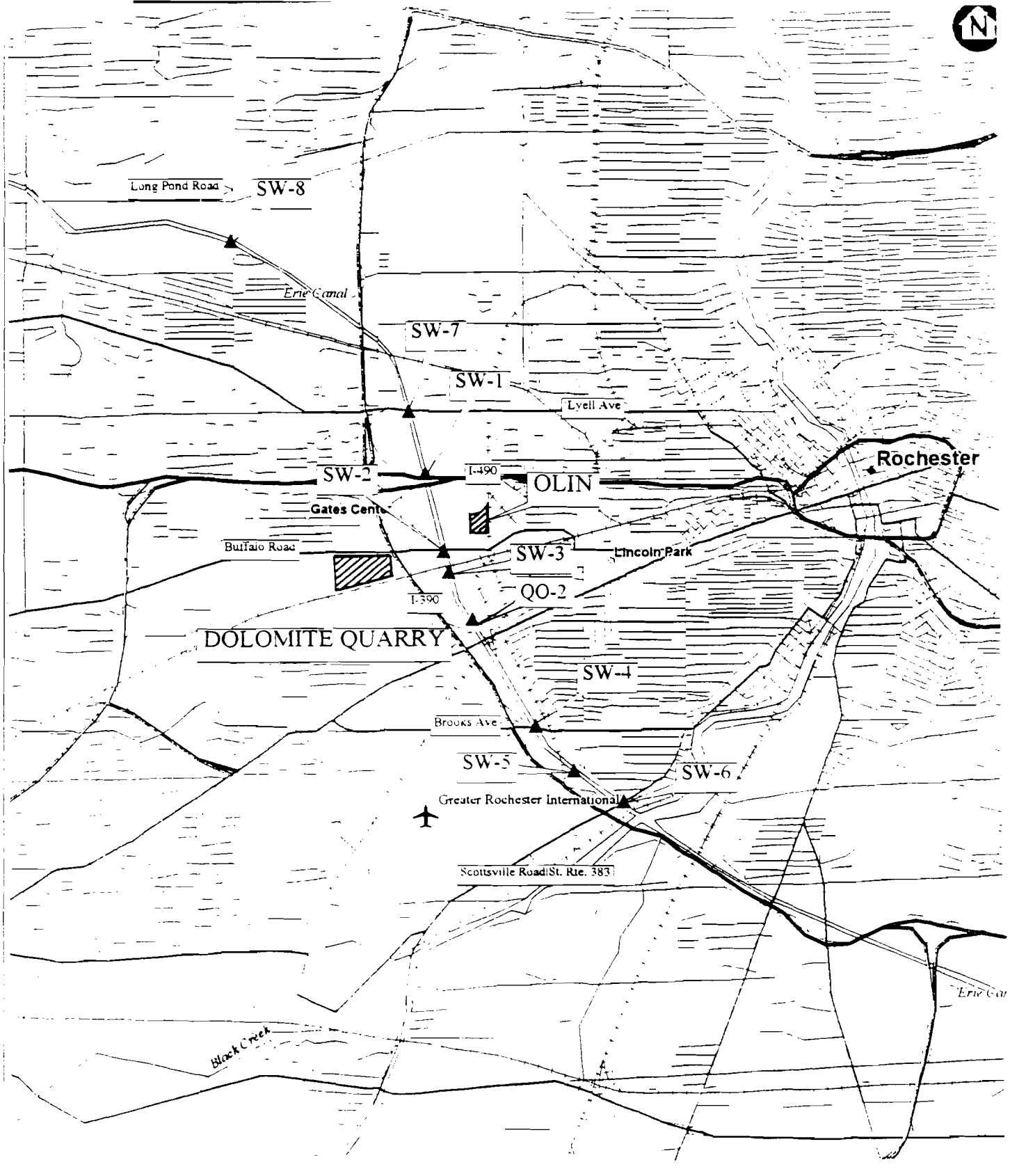
Thomas R. Eschner, R.G.
Project Manager/Principal Hydrogeologist

TRE/jpc
Attachments: Sample Location Maps - Attachment 1
Laboratory Data Summary Tables - Attachment 2
Chain of Custody Forms - Attachment 3

cc: J. Connolly
N. Brenton

ATTACHMENT 1

SAMPLE LOCATION MAPS



LEGEND

▲ SURFACE WATER SAMPLE LOCATION

0 1 MILE 2 MILES

SCALE: 1" = 1 MILE

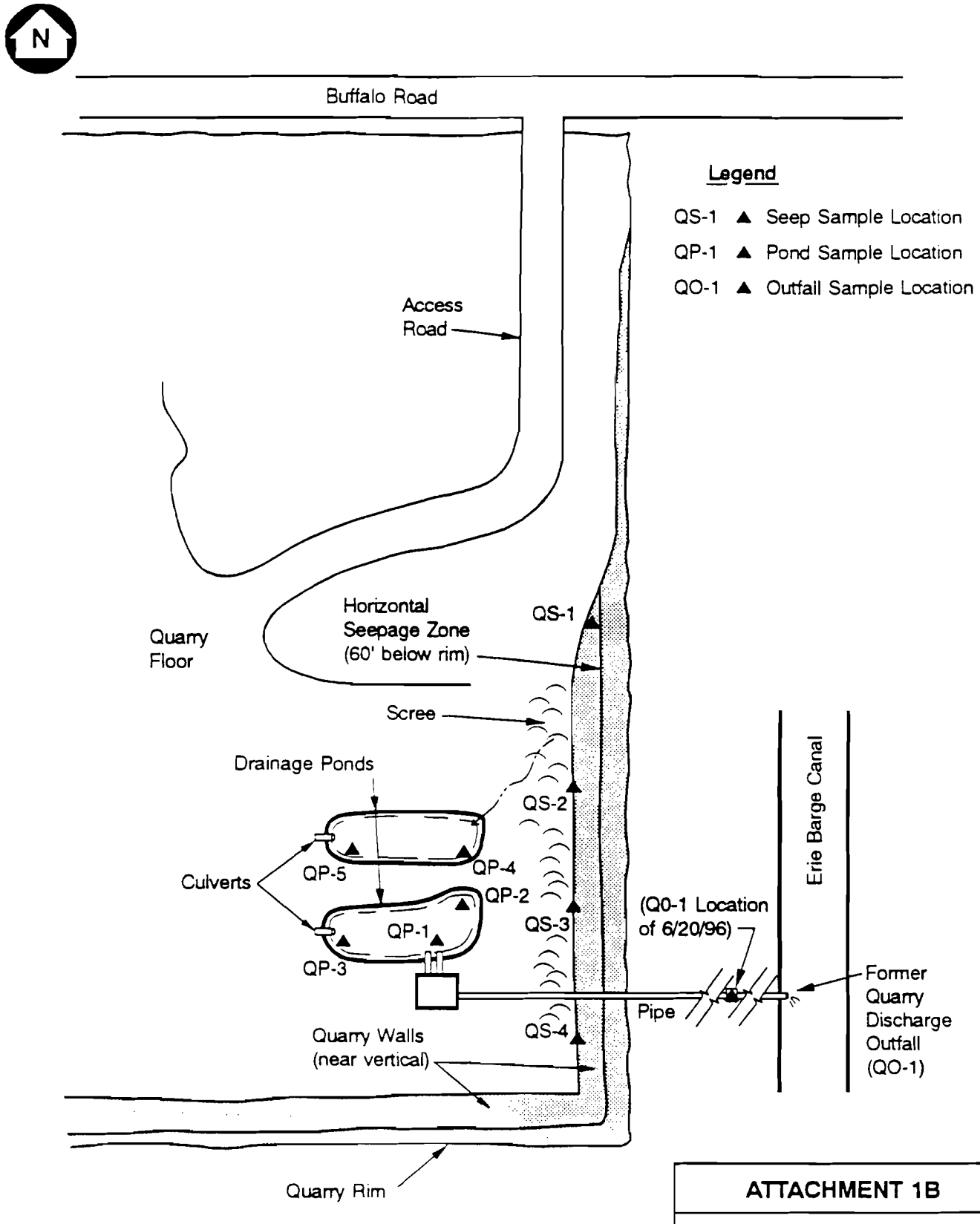
SOURCE: DeLorme Mapping 1995

ATTACHMENT 1A

SAMPLE LOCATIONS
ERIE BARGE CANAL

OLIN CHEMICALS
PHASE II RI REPORT ADDENDUM
ROCHESTER, N.Y.

1X7311.3A\7311501



Not to Scale

ATTACHMENT 1B

SAMPLE LOCATIONS DOLOMITE PRODUCTS QUARRY

OLIN CHEMICALS
PHASE II RI REPORT ADDENDUM
ROCHESTER, NEW YORK

W9603025D(e)

ATTACHMENT 2

LABORATORY DATA SUMMARY TABLES

Olin Chemicals
Rochester, NY
September 1996 Sampling Event

Selected Pyridine Analysis (ug/L)

Validated Data Table

LOCATION		SW-1	SW-2	SW-2 FD	SW-3	SW-4	SW-5
LAB ID		A6473001	A6473002	A6473002FD	A6473003	A6473004	A6473005
DATE SAMPLED		9/27/96	9/27/96	9/27/96	9/27/96	9/27/96	9/27/96
DATE EXTRACTED		10/1/96	10/1/96	10/1/96	10/1/96	10/1/96	10/1/96
DATE ANALYZED		10/3/96	10/3/96	10/3/96	10/3/96	10/3/96	10/3/96
SAMPLE TYPE		FS	FS	FD	FS	FS	FS
PARAMETER	RL						
2,6-Dichloropyridine	10	10 U	10 U	10 U	10 U	10 U	10 U
2-Chloropyridine	10	10 U	10 U	10 U	10 U	0.3 J	10 U
3-Chloropyridine	10	10 U	10 U	10 U	10 U	10 U	10 U
4-Chloropyridine	10	10 U	10 U	10 U	10 U	10 U	10 U
p-Fluoroaniline	10	10 U	10 U	10 U	R	10 U	10 U
Pyridine	10	10 U	10 U	10 U	10 U	10 U	10 U
DF		1	1	1	1	1	1
ANALYSIS		ASP91	ASP91	ASP91	ASP91	ASP91	ASP91

ASP91 = 1991 New York State Analytical Services Protocol
J = estimated value below reporting limit, but greater than zero
D = value obtained from a secondary dilution
R = rejected value

Olin Chemicals
Rochester, NY
September 1996 Sampling Event

Selected Pyridine Analysis (ug/L)

Validated Data Table

LOCATION		SW-6	SW-7	SW-8
LAB ID		A6473006	A6473007	A6473008
DATE SAMPLED		9/27/96	9/27/96	9/27/96
DATE EXTRACTED		10/1/96	10/2/96	10/2/96
DATE ANALYZED		10/3/96	10/3/96	10/15/96
SAMPLE TYPE		FS	FS	FS
PARAMETER	RL			
2,6-Dichloropyridine	10	10 U	10 U	10 U
2-Chloropyridine	10	10 U	10 U	10 U
3-Chloropyridine	10	10 U	10 U	10 U
4-Chloropyridine	10	10 U	10 U	10 U
p-Fluoroaniline	10	10 U	10 U	10 U
Pyridine	10	10 U	10 U	10 U
DF		1	1	1
ANALYSIS		ASP91	ASP91	ASP91

ASP91 = 1991 New York State Analytical Services Protocol
J = estimated value below reporting limit, but greater than zero
D = value obtained from a secondary dilution
R = rejected value

Olin Chemicals
Rochester, NY
September 1996 Sampling Event

Validated Data Table

Selected Pyridine Analysis (ug/L)

LOCATION		QO-2	QP-2	QP-3	QP-4	QP-5	QS-4
LAB ID		A6468807	A6468803	A6468804	A6468805	A6468806	A6468802
DATE SAMPLED		9/25/96	9/25/96	9/25/96	9/25/96	9/25/96	9/25/96
DATE EXTRACTED		9/30/96	9/30/96	9/30/96	9/30/96	9/30/96	9/30/96
DATE ANALYZED		10/2/96	10/2/96	10/2/96	10/2/96	10/2/96	10/2/96
SAMPLE TYPE		FS	FS	FS	FS	FS	FS
PARAMETER	RL						
2,6-Dichloropyridine	10	24	38	33	0.6 J	2 J	550 DJ
2-Chloropyridine	10	92 D	150 D	110 D	5 J	10	2800 D
3-Chloropyridine	10	6 J	8 J	6 J	10 U	10 U	72 D
4-Chloropyridine	10	10 U	10 U	10 U	10 U	10 U	10 U
p-Fluoroaniline	10	10 U	10 U	10 U	10 U	10 U	2 J
Pyridine	10	10 U	10 U	10 U	10 U	10 U	10 U
DF		1	1	1	1	1	1
ANALYSIS		ASP91	ASP91	ASP91	ASP91	ASP91	ASP91

ASP91 = 1991 New York State Analytical Services Protocol
J = estimated value below reporting limit, but greater than zero
D = value obtained from a secondary dilution
R = rejected value

Olin Chemicals
Rochester, NY
September 1996 Sampling Event

Validated Data TAble

Volatile Organic ASP91 Analysis (ug/L)

LOCATION		QP-2	QS-4
LAB ID		A6468803	A6468802
DATE SAMPLED		9/25/96	9/25/96
DATE ANALYZED		9/30/96	9/30/96
SAMPLE TYPE		FS	FS
PARAMETER	RL		
1,1,1-Trichloroethane	10	10 U	10 U
1,1,2,2-Tetrachloroethane	10	10 U	10 U
1,1,2-Trichloroethane	10	10 U	10 U
1,1-Dichloroethane	10	10 U	10 U
1,1-Dichloroethene	10	10 U	10 U
1,2-Dichloroethane	10	10 U	10 U
1,2-Dichloroethene (Total)	10	10 U	10 U
1,2-Dichloropropane	10	10 U	10 U
2-Butanone	10	10 U	10 U
2-Hexanone	10	10 U	10 U
4-Methyl-2-pentanone	10	10 U	10 U
Acetone	10	10 U	10 U
Benzene	10	10 U	4 J
Bromodichloromethane	10	10 U	10 U
Bromoform	10	10 U	10 U
Bromomethane	10	10 U	10 U
Carbon Disulfide	10	10 U	10 U
Carbon Tetrachloride	10	10 U	10 U
Chlorobenzene	10	10 U	7 J
Chloroethane	10	10 U	10 U
Chloroform	10	10 U	10 U
Chloromethane	10	10 U	10 U
cis-1,3-Dichloropropene	10	10 U	10 U
Dibromochloromethane	10	10 U	10 U
Ethylbenzene	10	10 U	10 U
Methylene chloride	10	10 U	10 U
Styrene	10	10 U	10 U
Tetrachloroethene	10	10 U	10 U
Toluene	10	10 U	10 U
Total Xylenes	10	10 U	10 U
trans-1,3-Dichloropropene	10	10 U	10 U
Trichloroethene	10	10 U	10 U
Vinyl chloride	10	10 U	10 U
DF		1	1
Analysis		ASP91	ASP91

ASP91 = 1991 New York State Analytical Services Protocol
J = estimated value below reporting limit, but greater than zero

Olin Chemcials
Rochester, NY
September 1996 Sampling Event

Validated Data Table

Semivolatile Organic ASP91 Analysis (ug/L)

LOCATION		QP-2	QS-4
LAB ID		A6468803	A6468802
DATE SAMPLED		9/25/96	9/25/96
DATE EXTRACTED		9/30/96	9/30/96
DATE ANALYZED		10/2/96	10/2/96
SAMPLE TYPE		FS	FS
PARAMETER	RL		
1,2,4-Trichlorobenzene	10	10 U	10 U
1,2-Dichlorobenzene	10	10 U	1 J
1,3-Dichlorobenzene	10	10 U	10 U
1,4-Dichlorobenzene	10	10 U	10 U
2,4,5-Trichlorophenol	25	25 U	25 U
2,4,6-Trichlorophenol	10	10 U	10 U
2,4-Dichlorophenol	10	10 U	10 U
2,4-Dimethylphenol	10	10 U	10 U
2,4-Dinitrophenol	25	25 U	25 U
2,4-Dinitrotoluene	10	10 U	10 U
2,6-Dinitrotoluene	10	10 U	10 U
2-Chloronaphthalene	10	10 U	10 U
2-Chlorophenol	10	10 U	10 U
2-Methylnaphthalene	10	10 U	10 U
2-Methylphenol	10	10 U	10 U
2-Nitroaniline	25	25 U	25 U
2-Nitrophenol	10	10 U	10 U
3,3'-Dichlorobenzidine	10	10 U	10 U
3-Nitroaniline	25	25 U	25 U
4,6-Dinitro-2-methylphenol	25	25 U	25 U
4-Bromophenyl phenyl ether	10	10 U	10 U
4-Chloro-3-methylphenol	10	10 U	10 U
4-Chloroaniline	10	10 U	10 U
4-Chlorodiphenylether	10	10 U	10 U
4-Methylphenol	10	10 U	10 U
4-Nitroaniline	25	25 U	25 U
4-Nitrophenol	25	25 U	25 U
Acenaphthene	10	10 U	10 U
Acenaphthylene	10	10 U	10 U
Anthracene	10	10 U	10 U
Benzo(a)anthracene	10	10 U	10 U
Benzo(a)pyrene	10	10 U	10 U
Benzo(b)fluoranthene	10	10 U	10 U
Benzo(ghi)perylene	10	10 U	10 U
Benzo(k)fluoranthene	10	10 U	10 U
Bis(2-chloroethoxy) methane	10	10 U	10 U

Olin Chemicals
Rochester, NY
September 1996 Sampling Event

Validated Data Table

Semivolatile Organic ASP91 Analysis (ug/L)

LOCATION		QP-2	QS-4
LAB ID		A6468803	A6468802
DATE SAMPLED		9/25/96	9/25/96
DATE EXTRACTED		9/30/96	9/30/96
DATE ANALYZED		10/2/96	10/2/96
SAMPLE TYPE		FS	FS
PARAMETER	RL		
Bis(2-chloroethyl) ether	10	10 U	10 U
Bis(2-chloroisopropyl) ether	10	10 U	10 U
Bis(2-ethylhexyl) phthalate	10	10 U	10 U
Butyl benzyl phthalate	10	10 U	0.4 J
Carbazole	10	10 U	10 U
Chrysene	10	10 U	10 U
Di-n-butyl phthalate	10	10 U	10 U
Di-n-octyl phthalate	10	10 U	10 U
Dibenzo(a,h)anthracene	10	10 U	10 U
Dibenzofuran	10	10 U	10 U
Diethyl phthalate	10	10 U	10 U
Dimethyl phthalate	10	10 U	10 U
Fluoranthene	10	10 U	10 U
Fluorene	10	10 U	10 U
Hexachlorobenzene	10	10 U	10 U
Hexachlorobutadiene	10	10 U	10 U
Hexachlorocyclopentadiene	10	10 U	10 U
Hexachloroethane	10	10 U	10 U
Indeno(1,2,3-cd)pyrene	10	10 U	10 U
Isophorone	10	10 U	10 U
N-Nitroso-Di-n-propylamine	10	10 U	10 U
N-nitrosodiphenylamine	10	10 U	10 U
Naphthalene	10	10 U	10 U
Nitrobenzene	10	10 U	10 U
Pentachlorophenol	25	25 U	25 U
Phenanthrene	10	10 U	10 U
Phenol	10	10 U	10 U
Pyrene	10	10 U	10 U
DF		1	1
Analysis		ASP91	ASP91

ASP91 = 1991 New York State Analytical Services Protocol
J = estimated value below reporting limit, but greater than zero

ATTACHMENT 3

CHAIN OF CUSTODY FORMS

RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: SA 5762

SITE NAME: OLIN - RI ~~WELLS~~ FS

SAMPLERS (SIGNATURE): [signature] / M. NAMAC

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	40 ml VIAL VOA (0103)	AMBER GLASS 1 L. WIDE MOUTH	AMBER GLASS 1 L. PYRIDINE	REMARKS
1	9-25-96	0700		✓	TRIP BLANK	2	2			
2		1330			QS-A	8	4	2	2	
3		1345			QP-2	18	6	6	6	MS/MSD
4		1340			QP-3	2			2	
5		1350			QP-4	2			2	
6		1400			QP-5	2			2	
7		1430		↓	QD-2	2			2	

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RECRA ENVIRONMENTAL, INC.

CHAIN OF CUSTODY RECORD

PROJECT NO: 5A5762

SITE NAME: Olin Roch RI

SAMPLERS (SIGNATURE): G. Bennett / M. Nemec

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	40 ml vial VOA	Amber liter Semi Vol / Pyridines	1 l P T. metals (0.01)	16 oz P T. CN (0.05)			REMARKS
1	9-27-92	0730		X	Trip Blanks	2	2						
2	↓	0930		↓	BR112A	9	4	3	1	1			[illegible]
3	↓	1150		↓	SW-1 [illegible]	2		2					
4	↓	1115		↓	SW-2	4		4					Field Duplicate
5	↓	1130		↓	SW-3	6		6					MS/MSD
6	↓	1015		↓	SW-4	2		2					
7	↓	1030		↓	SW-5	2		2					
8	↓	1000		↓	SW-6	2		2					
9	↓	1045		↓	SW-7	2		2					
10	↓	1055		↓	SW-8	2		2					
11	↓	0955		↓	Bailer rinse BLANK	2		2					
						35							

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[signature]	9-27-92 1400	[signature]			

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RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE / TIME	REMARKS

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ASEA BROWN BOVERI

January 24, 1997

Mr. Michael Bellotti
Olin Chemical Corporation
P.O. Box 248, Lower River Road
Charleston, TN 37310

Subject: **Olin Rochester Site - Fourth Quarter 1996 Erie Barge Canal Water and Quarry Sampling Results**

Dear Mr. Bellotti:

This letter presents the results of chemical analysis and describes the sampling, analytical methodology, and analytical quality control for sampling conducted in December 1996 as follow up to the Phase II Remedial Investigation for the Olin Rochester site. Sampling results are enclosed for fourth quarter 1996 surface-water samples collected from the Erie Barge Canal (Canal) and the Dolomite Products Company quarry (quarry) as part of the on-going quarterly monitoring program.

Sampling

Canal water samples and quarry surface water samples were collected for selected pyridine analysis on December 16, 1996. The sampling locations are listed below.

Canal Samples	Quarry Seep Samples	Quarry Outfall Samples
SW-1	QS-4	QO-2
SW-2		QO-2U1*
SW-2 FD (field duplicate)		QO-2U2*
SW-3		QO-2D1*
SW-3 Matrix Spike		QO-2D2*
SW-3 Matrix Spike Duplicate		
SW-4		
SW-5		
SW-6		
SW-7		
SW-8		
SW-9*	QC Samples	
SW-10*	Bailer Rinse Blank	

The locations of these samples are shown on the attached maps of the Canal (Figure 1) and the vicinity of the quarry outfall (Figure 2). Samples marked with an asterisk are new locations.

ABB Environmental Services, Inc.

511 Congress Street
P O Box 7050
Portland, Maine 04112-7050

Telephone (207) 775-5401

Fax (207) 772-4762

The sample from SW-9 was collected approximately two miles north of SW-8 near Elmgrove Road and Ridgeway. SW-10 is located approximately 3/4 miles south of SW-6 near Kendric Road, on the south side of the Genesee River. The additional outfall samples were collected 100 feet and 200 feet north (QO-2U1 and QO-2U2) and 100 and 200 feet south (QO-2D1 and QO-2D2) of the outfall location.

Analytical Procedures and Data Review

All water samples were analyzed in accordance with 1991 New York State Category B Analytical Services Protocols (ASP91) for the Olin suite of selected pyridines (pyridine, 2-chloropyridine, 3-chloropyridine, 4-chloropyridine, 2,6-dichloropyridine, and p-fluoroaniline). The reporting limit for the selected pyridines is 10 micrograms per liter (µg/L).

A preliminary review of the quality control sample results associated with the analytical results was performed for data quality assurance purposes. Sample results were reviewed for holding time compliance, surrogate standard recoveries, blank contamination, matrix spike blank/matrix spike blank duplicate (MSB/MSBD), and matrix spike/matrix spike duplicate (MS/MSD) accuracy and precision. The results of the data review are discussed in the quality control section of this letter.

Analytical Results

The results from the Canal and quarry December 1996 monitoring event are summarized below; all results are expressed in µg/L.

Sample Id	2-CPYR	3-CPYR	2,6-DCPYR
SW-1	**2 J**	ND	ND
SW-2	**5 J**	ND	**0.9 J**
SW-2 FD	**4 J**	ND	**0.8 J**
SW-3	**8 J**	ND	**1 J**
SW-4	ND	ND	ND
SW-5	ND	ND	ND
SW-6	ND	ND	ND
SW-7	**3 J**	ND	**0.6 J**
SW-8	**2 J**	ND	ND
SW-9	**4 J**	**ND**	**0.6 J**
SW-10	ND	ND	ND
QO-2	**26**	**1 J**	**5 J**
QO-2D1	ND	ND	ND
QO-2D2	**0.5 J**	ND	ND

QO-2U1	**2 J**	ND	ND
QO-2U2	**3 J**	ND	ND
QS-4	**1900 D**	**290 J**	**42 J**

J = Estimated value below reporting limit, but greater than zero.
ND = Not Detected
D = Value obtained from a dilution
2-CPYR = 2-chloropyridine
3-CPYR = 3-chloropyridine
2,6-DCPYR = 2,6-dichloropyridine
FD = Field Duplicate

Estimated concentrations (below laboratory reporting limits) of 2-chloropyridine and/or 2,6-dichloropyridine were detected at all Canal surface-water sampling locations north of the quarry outfall. No selected pyridine compounds were detected in any samples collected south of the quarry outfall, with the exception of one estimated 2-chloropyridine detection (0.5 J ug/L) 200 feet south of the quarry outfall (QO-2D2). Quarry outfall results also indicate substantial dilution is occurring at the outfall location (QO-2). The Canal water level during this sampling event was lower than during late spring through mid-autumn, and water flow is suspected to be northward, or reversed from high water-level conditions.

The seep surface-water sample collected from QS-4 continues to show elevated selected pyridine results. These results are generally consistent with results from previous monitoring events.

Quality Control

As part of the Canal and quarry seep sampling program, one bailer rinse blank sample, one matrix spike/matrix spike duplicate (MS/MSD) sample, and one field duplicate sample was collected as quality control samples during the course of the December 1996 field event. All analytical holding times were met, field duplicate precision was met, and no target compounds were reported in the bailer rinse blank.

Conclusions

Results from the fourth quarter 1996 canal surface-water sampling program indicated the presence of trace concentrations (detected below the reporting limit, but above zero) of 2-chloropyridine and 2,6-dichloropyridine in all eight surface-water samples collected north from the quarry outfall.

These samples were collected from the established sampling locations SW-1, SW-2, SW-3, SW-7, and SW-8, as well as from three new locations north of the quarry outfall QO-2U1, QO-2U2, and sw-9 (see Figures 1 and 2).

The detections of selected pyridine concentrations in the samples collected north of the quarry outfall this quarter, as compared to results from last quarter (September 1996), suggest that when the Canal water level is lowered, water flow is temporarily reversed. No selected pyridine compounds were detected in any samples collected south of the quarry outfall, with the exception of one estimated 2-chloropyridine detection (0.5 J ug/L) 200 feet south of the quarry outfall.

Concentrations of selected pyridines in the quarry seep sample (QS-4) and quarry outfall (QO-2) are roughly half the concentrations observed during the third quarter 1996 event. Quarry outfall results also indicate that substantial dilution is occurring once discharge water is introduced into the Canal.

Please call if you have any questions or comments on the material described in this letter.

Sincerely,

ABB ENVIRONMENTAL SERVICES, INC.

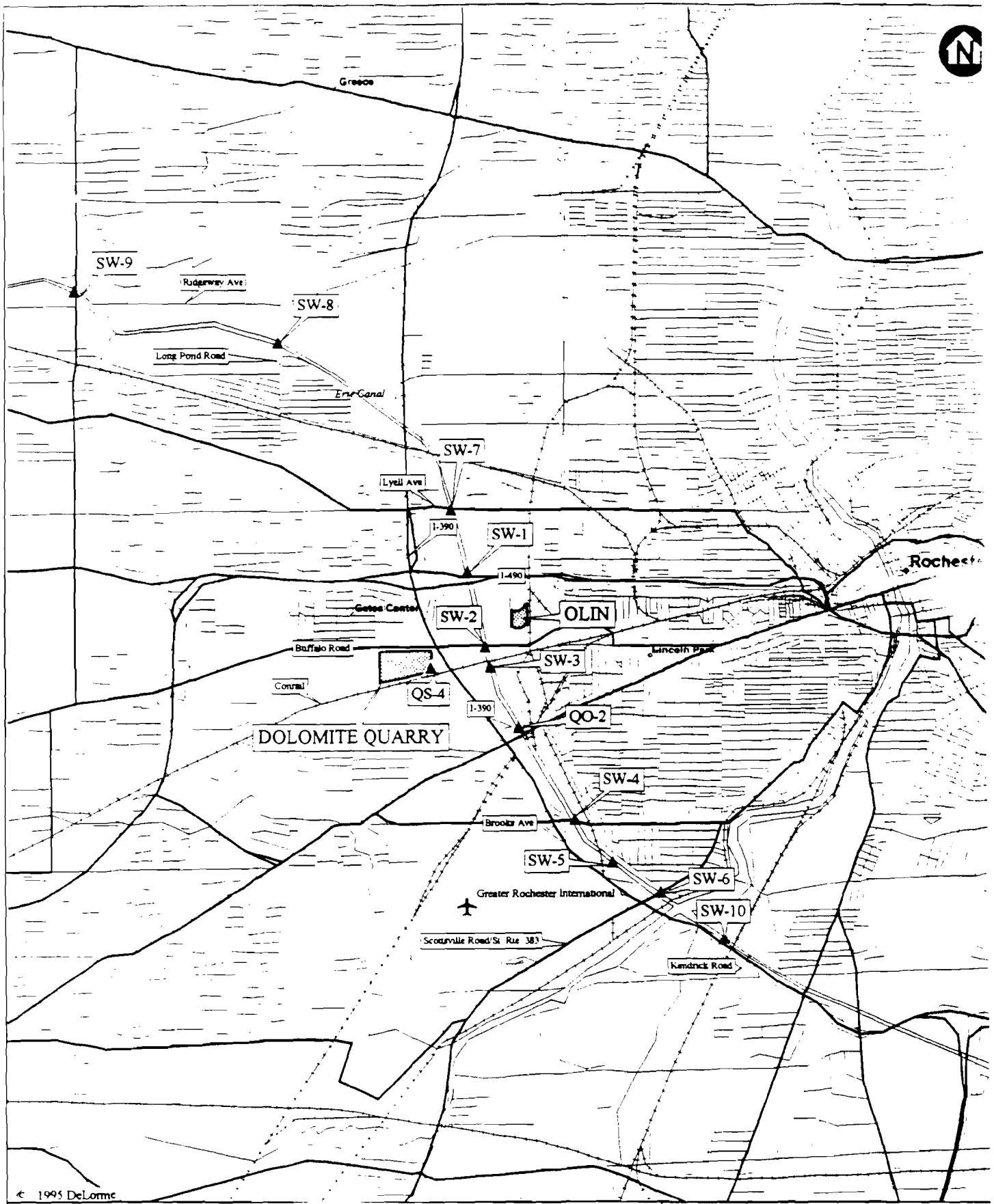
Thomas R. Eschner, R.G.
Project Manager/Principal Hydrogeologist

TRE/jpc
Attachments: Sample Location Maps - Attachment 1
Laboratory Data Summary Tables - Attachment 2
Chain of Custody Forms - Attachment 3

cc: J. Connolly
N Breton

ATTACHMENT 1

SAMPLE LOCATION MAPS



LEGEND

▲ SURFACE WATER SAMPLE LOCATION

0 1 MILE 2 MILES

SCALE: 1" = 1 MILE

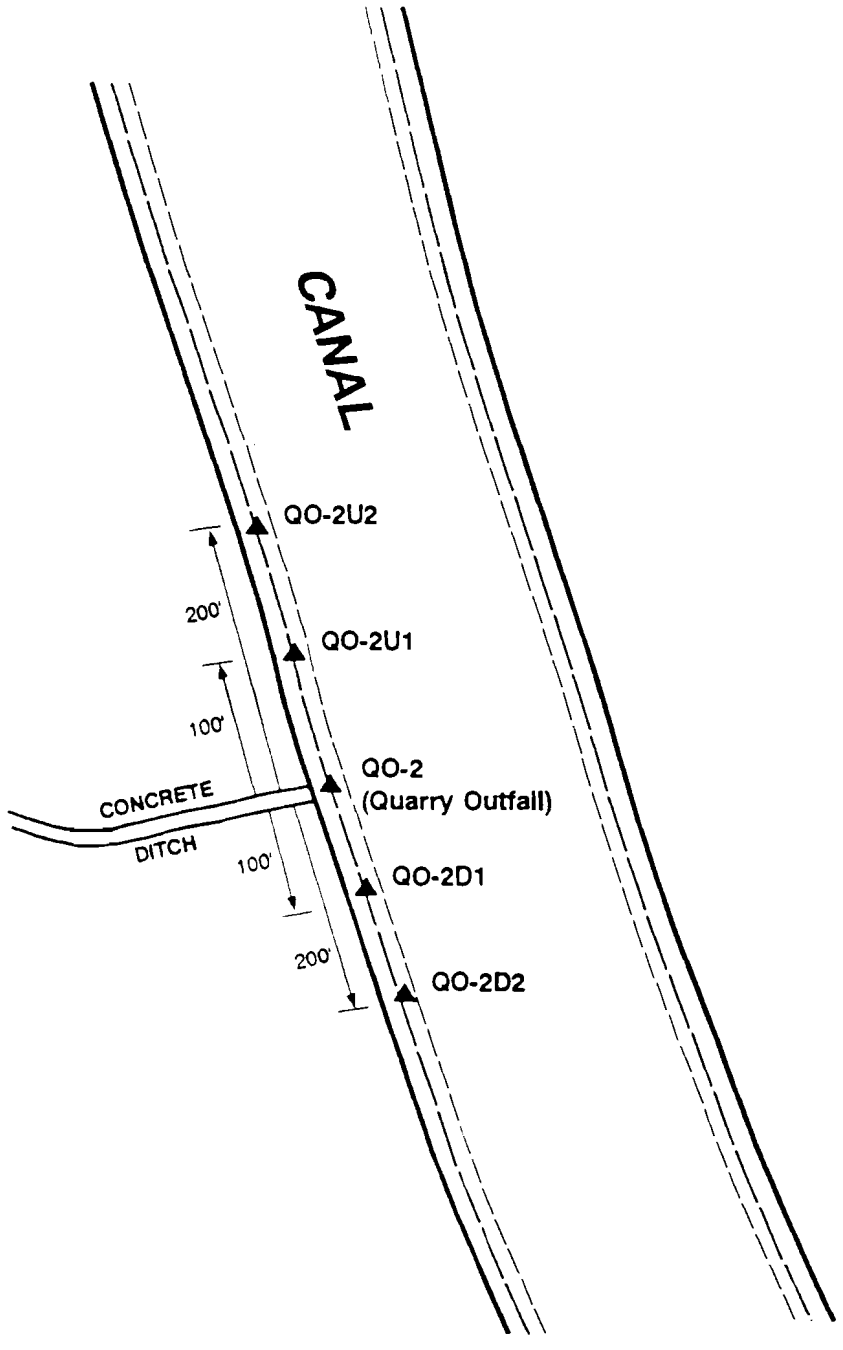
SOURCE: DeLorme Mapping 1995

FIGURE 1

SAMPLE LOCATIONS ERIE BARGE CANAL

OLIN CHEMICALS
ROCHESTER, N.Y.

T:\7311-34\7311F501 C&P 1/23/97



N

NOT TO SCALE

FIGURE 2

SAMPLE LOCATIONS
NEAR
QUARRY OUTFALL

OLIN CHEMICALS
ROCHESTER, N.Y

W9701021D

ATTACHMENT 2

LABORATORY DATA SUMMARY TABLES

Olin Chemicals
Rochester, NY
December 1996 Sampling Event

Selected Pyridine ASP91 Analysis (ug/L)

Validated Data Table

Sample Location		QO-2	QO-2D1	QO-2D2	QO-2U1	QO-2U2	QS-4	SW-1	SW-2
Lab ID		A6602211	A6602214	A6602215	A6602212	A6602213	A6602216	A6602201	A6602202
Date Sampled		12/16/96	12/16/96	12/16/96	12/16/96	12/16/96	12/16/96	12/16/96	12/16/96
Type		FS	FS	FS	FS	FS	FS	FS	FS
PARAMETER	RL								
2,6-Dichloropyridine	10	5 J	10 U	11 U	10 U	10 U	290 J	10 U	0.9 J
2-Chloropyridine	10	26	10 U	0.5 J	2 J	3 J	1900	2 J	5 J
3-Chloropyridine	10	1 J	10 U	11 U	10 U	10 U	42 J	10 U	10 U
4-Chloropyridine	10	11 U	10 U	11 U	10 U	10 U	800 U	10 U	10 U
p-Fluoroaniline	10	11 U	10 U	11 U	10 U	10 U	800 U	10 U	10 U
Pyridine	10	11 U	10 U	11 U	10 U	10 U	800 U	10 U	10 U
Dilution Factor		1	1	1	1	1	80	1	1

QO-2 = Quarry Outfall
QO-2D1 = 100 ft downstream of QO-2
QO-2D2 = 200 ft downstream od QO-2
QO-2U1 = 100 ft upstream of QO-2
QO-2U2 = 200 ft upstream of QO-2
QS = Quarry Seep
SW = Surface Water
FS = Field Sample
FD = Field Duplicate Sample
RB = Rinse Blank
J = Estimated value below reporting limit, but greater than zero
U = Compound was not detected
ASP91 = 1991 New York State Analytical Services Protocol

Olin Chemicals
Rochester, NY
December 1996 Sampling Event

Selected Pyridine ASP91 Analysis (ug/L)

Validated Data Table

Sample Location	SW-2 FD	SW-3	SW-4	SW-5	SW-6	SW-7	SW-8	SW-9	SW-10
Lab ID	A6602202FD	A6602203	A6602204	A6602205	A6602206	A6602207	A6602208	A6602209	A6602210
Date Sampled	12/16/96	12/16/96	12/16/96	12/16/96	12/16/96	12/16/96	12/16/96	12/16/96	12/16/96
Type	FD	FS	FS	FS	FS	FS	FS	FS	FS
PARAMETER									
2,6-Dichloropyridine	0.8 J	1 J	10 U	10 U	10 U	0.6 J	10 U	0.6 J	11 U
2-Chloropyridine	4 J	8 J	10 U	10 U	10 U	3 J	2 J	4 J	11 U
3-Chloropyridine	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
4-Chloropyridine	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
p-Fluoroaniline	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
Pyridine	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	11 U
Dilution Factor	1	1	1	1	1	1	1	1	1

QO-2 = Quarry Outfall
QO-2D1 = 100 ft downstream of QO-2
QO-2D2 = 200 ft downstream od QO-2
QO-2U1 = 100 ft upstream of QO-2
QO-2U2 = 200 ft upstream of QO-2
QS = Quarry Seep
SW = Surface Water
FS = Field Sample
FD = Field Duplicate Sample
RB = Rinse Blank
J = Estimated value below reporting lim
U = Compound was not detected
ASP91 = 1991 New York State Analytic

Olin Chemicals
Rochester, NY
December 1996 Sampling Event

Selected Pyridine ASP91 Analysis (ug/L)

Validated Data Table

Sample Location	BAILER RINSE BLANK
Lab ID	A6802217
Date Sampled	12/16/96
Type	RB
PARAMETER	
2,6-Dichloropyridine	10 U
2-Chloropyridine	10 U
3-Chloropyridine	10 U
4-Chloropyridine	10 U
p-Fluoroaniline	10 U
Pyridine	10 U
Dilution Factor	1

QO-2 = Quarry Outfall
QO-2D1 = 100 ft downstream of QO-2
QO-2D2 = 200 ft downstream od QO-2
QO-2U1 = 100 ft upstream of QO-2
QO-2U2 = 200 ft upstream of QO-2
QS = Quarry Seep
SW = Surface Water
FS = Field Sample
FD = Field Duplicate Sample
RB = Rinse Blank
J = Estimated value below reporting lim
U = Compound was not detected
ASP91 = 1991 New York State Analytic

ATTACHMENT 3

CHAIN OF CUSTODY FORMS

RECRA LABNET, a division of Recra Environmental, Inc.

CHAIN OF CUSTODY RECORD

PROJECT NO	SITE NAME
SA5762	Olin Rochester

SAMPLERS (SIGNATURE): G. Barrett / K. Frost

1 OF 2

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	1 2 Amber 5' Fr Glass	REMARKS
1	12/16/96	0915		X	SW-1	2	2	
2		1400			SW-2	4	4	field Duplicate
3		1305			SW-3	6	6	MS/MSD
4		1115			SW-4	2	2	
5		1150			SW-5	2	2	
6		1155			SW-6	2	2	
7		1053			SW-7	2	2	
8		1045			SW-8	2	2	
9		1035			SW-9	2	2	
10		1140			SW-10	2	2	
11		1210			QO-2	2	2	
12		1235			QO-2U1	2	2	
13		1222			QO-2U2	2	2	
14		1245			QO-2D1	2	2	

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D. Nagel	12/16/96 1610				
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				Cooler = 10 / ice / c	

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RECRA LABNET, a division of Recra Environmental, Inc.

CHAIN OF CUSTODY RECORD

2 of 2

PROJECT NO: SA5762 | SITE NAME: Olin Rochester

SAMPLERS (SIGNATURE): G. Bennett / K. Furst

STATION NO	DATE	TIME	COMP	GRAB	STATION LOCATION	NO OF CONTAINERS	1 Amber 5 VOA Preserved	REMARKS
15	12/8/96	1258		X	QD-202	2	2	
16		1420			QS-4	2	2	
17		1415			Bailer rinseblank	2	2	
					TOTAL	40		

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[signature]	12/16/96 1600	[signature]			
RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)	RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED BY (SIGNATURE)
		[signature]			
RELINQUISHED BY (SIGNATURE)	DATE / TIME	RECEIVED FOR LABORATORY BY (SIGNATURE)	DATE / TIME	REMARKS	
				Coolers = 10 / 10 / 9	

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FILE COPY

Olin

P.O. BOX 248, 1186 LOWER RIVER ROAD, CHARLESTON, TN 37310
Phone: (423) 336-4000

November 21, 1996

Mr. Steven Shost
New York State Department of Health
Bureau of Environmental Exposure Investigation
2 University Place
Albany, NY 12203

Re: Olin Rochester RI/FS
Olin Chemicals (Site #628018a) 100 McKee Rd, Rochester, NY

Dear Mr. Shost:

I have attached a letter report concerning health risk issues relating to Olin's ongoing study at our Rochester, NY facility. This letter, prepared by Olin's consultant ABB Environmental Services, is in response to your concerns regarding health risk calculations for surface water quality in the Barge Canal.

Olin's understanding, based on prior conversations and conference calls, is that this report has adequately addressed the health risk issues that you have identified.

Olin will continue to monitor the occurrence of pyridine compounds in the Barge canal and to keep NYSDOH, Monroe County DOH and NYSDEC informed of progress.

We thank you for your input and assistance. Please direct any further questions to me at 423 / 336-4587.

Sincerely,

Michael J. Bellotti

Michael J. Bellotti
Olin Corporation

att.

cc:
Jim Craft: NYSDEC East Avon, NY
John Kranjc: Olin Rochester
William Norman: Olin Rochester
Laura Tew: Olin Charleston
Brenda Zona: Olin Norwalk
John Burns: Olin Charleston
Monica L. Fries, Esq.: Husch & Eppenberger, St. Louis, MO
Thomas Eschner: ABB, Portland, ME

PHASE II REMEDIAL INVESTIGATION
SUPPLEMENTAL HUMAN HEALTH RISK EVALUATION
ERIE BARGE CANAL

OLIN CHEMICALS
ROCHESTER PLANT SITE
ROCHESTER, NEW YORK

Submitted to:

Division of Environmental Health Assessment
New York State Department of Health
II University Place, Room 205
Albany, New York 12203-3399

Prepared by:

ABB Environmental Services, Inc.
511 Congress Street
Portland, Maine 04101

NOVEMBER 1996

This submittal has been prepared to respond to interim comments from the New York State Department of Public Health (NYSDOH) on the Olin Fact Sheet (September 1996) and Phase II Remedial Investigation Addendum (June, 1996). The submittal is composed of three parts: 1) Summary of Comments; 2) Summary of Responses; and 3) Response Actions.

Summary of Comments

As discussed in a telephone conference with Steven Shost of NYSDOH on October 3, 1996, four issues raised by NYSDOH need to be addressed. These issues are summarized below:

- **Risk Estimates for Quarry Outfall Water.** Surface-water samples collected in the Erie Barge Canal may not have adequately characterized the surface-water concentrations in the vicinity of the quarry outfall. Therefore, human health risks for this reach of the canal may not have been adequately characterized. Olin must collect surface-water samples seasonally from the outfall and the reach of the canal near the outfall, and the human health risk assessment (HHRA) must evaluate risks from swimming exposures in the vicinity of the quarry outfall.

- **Chloropyridine Method Study.** The laboratory quality control (QC) data indicate that analytical recoveries of some indicator compounds (i.e., chloropyridines, pyridine, and p-fluoroanaline; hereafter collectively referred to as "chloropyridines") may be low and this, in turn, may have resulted in a low bias in the reported Site data. Olin should conduct a method study to either improve the recovery of chlorinated pyridines or determine a correction factor to be used in estimating the actual concentrations of chloropyridines.

- **Risk Evaluation for Ingestion of Fish.** Olin should evaluate the risks from exposures to site-related chemicals via ingestion of fish taken from the Erie Barge Canal.

- **Sensitivity Analysis.** Olin must provide information regarding the chemical-physical properties (i.e., octanol-water partition coefficients, bioaccumulation factors, dermal permeability factors) of chloropyridines. These data are needed to evaluate exposures and to develop a tabulated range of risk threshold concentrations corresponding to cancer risk and hazard index based upon the uncertainty inherent in the assumptions being made.

Summary of Responses

To address these comments, Olin has conducted the following activities:

1) **Risk Estimates for Quarry Outfall Water.** To address the concern for adequate characterization of risks from swimming exposures to surface-water in the vicinity of the

quarry outfall, risk estimates were calculated for exposures to the undiluted quarry outfall water. This represents an extremely conservative approach because canal surface-water concentrations in the vicinity of the quarry outfall would be expected to be considerably lower than the concentrations in the water pumped from the quarry. In addition, because the quarterly surface-water monitoring data may show variation in the identity and quantity of chloropyridines, risk-based concentrations (RBCs) were also calculated for chloropyridine compound. The RBCs represent concentrations of chloropyridines which correspond to specified levels of risk. RBCs can be compared to quarterly monitoring analytical data to put the data into context with respect to potential risks.

2) **Chloropyridine Method Study.** To evaluate the potential effect of analytical recoveries, Olin completed a pyridine method study for data from the Rochester site. Matrix spike blank (MSB), matrix spike (MS), and matrix spike duplicate (MSD) recoveries for the pyridine spiking compounds were tabulated for analyses conducted since August 1995. From these recovery data, minimum, maximum, and average recoveries were calculated.

3) **Risk Evaluation for Ingestion of Fish.** To evaluate risks to recreational anglers from ingestion of site-related chemicals in fish taken from the canal, Olin calculated risk estimates for fish tissue ingestion. To provide a conservative evaluation that does not overlook potential risks, fish tissue concentrations were modelled using the bioconcentration factors presented in the draft Phase II Environmental Risk Assessment (ERA) (ABB-ES, 1996) and analytical surface-water data that include the quarry outfall, and risk estimates were calculated using USEPA default parameters for recreational fishing.

4) **Sensitivity Analysis.** To help describe the uncertainty associated with the chemical-physical data and the exposure assumptions used in the adult swimmer exposure scenario, Olin developed RBCs from risk estimates for minimum, average, and maximum exposure assumptions. To address the uncertainties associated with use of parameters for pyridine as surrogates for chemical-specific information for the chloropyridines, RBCs were calculated for a range of chemical-physical parameters and receptor exposure parameters. From the ranges of parameters, a limited sensitivity analysis was conducted by combining parameters to generate minimum, average, and maximum exposure and risk estimates. The risk estimates were used to develop a range of RBCs that bracket the range of chloropyridine concentrations that could potentially result in risk under most conceivable swimming exposure conditions. Comparison of measured water concentrations to RBCs based on the most stringent exposure conditions represents an extremely conservative evaluation of potential risks

Detailed Responses

The following paragraphs summarize the actions to the responses described above.

I. Surface-water Risk Estimates for Exposures to Quarry Outfall Water.

Risk estimates were calculated for ingestion and dermal exposures for a swimmer exposed to Erie Barge Canal surface-water. Because no surface-water samples have been collected from the canal in close proximity to the quarry outfall, chloropyridine concentrations reported in the quarry outfall water were used to represent canal surface-water concentrations in the vicinity of the outfall. Specifically, data from the June 26, 1996 sampling of location SQWD02 were used as the exposure point concentrations. Risks were calculated using the adult swimmer exposure parameters and methodology presented in the Phase II HHRA (ABB-ES, 1996). However, the surface-water ingestion exposure pathway was also incorporated into the exposure estimates to provide a risk estimate for combined dermal contact and ingestion exposure to a swimmer.

Table 1 presents the risk estimates for adult swimmer exposures to the quarry outfall water. As indicated in Table 1, the estimated cancer risk is $2x10^{-7}$, and the estimated non-cancer risk is HI = 0.00006. These risks are well below the USEPA acceptable cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ and threshold HI of 1. These risk estimates represent very conservative estimates of potential risks to adult swimmers because they are based on the chloropyridine concentrations reported in the outfall water. Because the outfall water, which is thought to be the primary source of indicator chemicals to the canal, would be substantially diluted once mixed with the canal water, risks for exposures to actual surface-water concentrations in this reach of the canal would be substantially lower.

To help place future quarterly canal surface-water analytical monitoring data into context with respect to potential risks, RBCs were developed for each indicator parameter. RBCs were calculated for the adult swimmer exposure scenario and were based on the same exposure parameters that were used to calculate risks for exposures to the quarry outfall water. The risk calculations are presented in Attachment A, Table A-1. RBCs were calculated from risk estimates using the following equality:

$$\frac{\textit{Total Receptor Risk}}{\textit{Assumed Water Concentration}} = \frac{\textit{Target Risk}}{\textit{RBC}}$$

where: Total risk is the ELCR or HI calculated for a given receptor (sum of risks for ingestion and dermal exposure pathways) at the assumed indicator compound concentration (i.e, 1 mg/L), and Target Risk is fixed ELCR or HI

Table 2 presents the RBCs for each indicator compound. As shown in Table 2, RBCs were calculated for cancer risk levels of $1x10^{-6}$ to $1x10^{-4}$, and for non-cancer His of 0.1 to 10. As discussed previously, these RBCs are indicator chemical concentrations that correspond to specified risk levels under the conditions assumed in the adult swimmer exposure scenario.

It should be noted that RBCs were developed for all six Site indicator compounds. Some of these compounds have not been detected in canal surface-water, quarry outfall water, or even the source to the quarry outfall water (i.e., the quarry seeps). Presentation of RBCs in this submittal does not suggest that undetected chloropyridines are present in canal or outfall water, nor that they pose a risk of concern under current site conditions.

II. Chloropyridine Method Study

ABB Environmental Services, Inc. (ABB-ES) conducted a method study on behalf of Olin using data from August 1995 through August 1996. The study indicates average recoveries for the spiking compounds are well within the compound-specific recovery ranges established by the laboratory. Average percent recoveries for the spiking compounds are summarized below:

2-chloropyridine	MSB = 73	MS/MSD = 69
3-chloropyridine	MSB = 71	MS/MSD = 62
2,6-dichloropyridine	MSB = 68	MS/MSD = 59
p-fluoroaniline	MSB = 29	MS/MSD = 23

The calculated minimum, maximum, and average concentrations are tabulated for MSBs in Table 3, and for MS/MSDs in Table 4. The recoveries observed for both the MSB and MS/MSD analyses indicate that there is no appreciable matrix affect measured. Therefore, sample results would generally be acceptable (within analytical precision and accuracy of the method).

The method used by the laboratory is an USEPA-approved method which includes NYSDEC ASP QA/QC protocols. As such, this method meets DQO requirements for risk assessment purposes. Sample results obtained from this method outside compound-specific recovery ranges would then be biased (estimated) depending on the recovery observed. Sample results within the compound-specific recovery ranges would be used in risk assessment as quantitated. Variations in recovery within this range would be discussed as an uncertainty in the risk assessment. Based on the recoveries determined from the method study, for discussion of risk assessment uncertainties the concentrations of 2-chloropyridine, 3-chloropyridine, and 2,6-dichloropyridine may be increased by a factor of 1.5, and the concentration of p-fluoroaniline increased by a factor of 3.5.

Recra Environmental, Inc. (Recra) also performed a method study in March 1996, at the request of ABB-ES, to develop spike recovery quality-control limits for the spiking compounds (see Attachment B). Recra used all data generated during 1995 for their analysis. Their sample specific MS/MSD QC limits were established at the mean plus or minus three standard deviations, omitting data points falling below one-half the mean or above twice the mean. Recovery ranges for the compounds and associated QC limits are:

	Range	QC Recovery Limits
2-chloropyridine	30-126%	10-128%
3-chloropyridine	30- 81%	10-103%
2,6-dichloropyridine	39- 93%	10-129%
p-fluoroaniline	10- 44%	10- 95%

These ranges are used by ABB-ES in determining potential bias of reported sample results.

Although slightly different approaches were taken in these two independent method studies, the good agreement between the results indicates consistent recovery efficiencies for these compounds in water.

III. Risk Evaluation for Ingestion of Fish Taken from the Erie Barge Canal.

Risk estimates were calculated for ingestion of fish theoretically taken from the Erie Barge Canal to provide an assessment of the potential hazards that site indicator chemicals may pose to recreational anglers taking fish for consumption from the canal. For this evaluation, it was assumed that recreationally important fish species would occur in the reach of the canal where site chloropyridines were detected, and further that fish would bioconcentrate the chloropyridines. To provide a very conservative screening-level evaluation of potential risks, the average concentrations of surface-water samples from the June 1996 sampling event *including* the quarry outfall water data, were used to represent the surface-water concentrations associated with the canal reach containing site chloropyridines. (Since the outfall water is undiluted, including it as a canal surface-water exposure point provides a conservative estimate of the potential surface-water concentrations in that area of the canal). Fish tissue concentrations were estimated by multiplying the average surface-water concentrations by the chemical-specific bioconcentration factors developed for the Phase II ERA (ABB-ES, 1996). Recreational angler ingestion exposures to contaminated fish tissue were conservatively modelled by assuming that contaminated fish are consumed every day (USEPA, 1989). The modelled fish tissue concentrations, exposures parameters, and exposure and risk calculations are presented in Table 3.

The cancer risk estimate for ingestion of fish tissue is $2x10^{-7}$. The non-cancer HI for ingestion of contaminated fish tissue is 0.0001. These risk estimates are below the USEPA acceptable cancer risk range of $1x10^{-6}$ to $1x10^{-4}$ and threshold HI of 1. Even when summed

with potential swimmer exposures to quarry outfall water, the total receptor risk estimates are below a level of concern (i.e., below the acceptable risk range).

IV. Sensitivity Analysis - Adult Swimmer Exposure Scenario.

Chemical-physical data for the site chloropyridines were presented in the Phase II ERA (Table 4-14; ABB-ES, 1996). However, these parameters were not used in the draft Phase II HHRA. Rather, the HHRA used the parameters for pyridine as surrogates for chemical-specific information for the chloropyridines. To help describe the uncertainty associated with the chemical-physical data and the exposure assumptions used in the adult swimmer exposure scenario, risks were developed for minimum, average, and maximum exposure assumptions. RBCs were developed from these risk estimates using the approach described in item (1) (above).

Ranges of chemical-physical data and exposure assumption variables were developed by reviewing each parameter included in the exposure equations and identifying select parameters for adjustment, based on the availability and variability of data for the given parameter and uncertainty associated with the basis of the parameter value(s). From the identified ranges of parameter values, values were selected and combined for the purpose of generating maximum, average, and minimum estimates of exposure. Table 4 provides a summary of the exposure parameters included in the swimmer exposure equations and those that were selected for adjustment to generate the various ranges of exposure estimates. The average exposure parameter values are the reasonable maximum exposure (RME) values that were used in the Phase II HHRA and upon which the swimmer risk estimates discussed in item (1) are based. As shown in Table 6, the exposure estimates selected for adjustment were body surface area, body weight, exposure time, and permeability constant (Kp). Descriptions of the parameter adjustments follow:

- Surface area and body weight were adjusted to reflect the 5 percentile and 95 percentile values for men and women. The ratio of surface area to body weight reflects the dermal dose. The 95 percentile surface area and body weight values for men correspond to a ratio of 231 cm^2/kg, and the 5 percentile values for women correspond to a ratio of 317 cm^2/kg. Therefore, the minimum exposure level parameters reflect the 95 percentile values for men, whereas the maximum exposure level values represent the 5 percentile values for women. The average exposure level values represent the 50 percentile values for men.

- The exposure time was adjusted to reflect a range of swimming exposure periods. Although the selected values are estimates (i.e., there are no literature data to support the assumptions), it is unlikely that any person would swim in the canal for more than two hours per day. The selected values provide a range of potential swimming exposures spanning a factor of four in duration.

- The Kp parameter was selected for adjustment because there is considerable

chemical-to-chemical variability in Kp values. The average Kp values were developed using an algorithm based on the indicator chemical-specific octanol to water partition coefficient. This is the approach that was used to develop the Kp values for the Phase II HHRA (although chemical-specific partition coefficients were not used in the Phase II HHRA). The minimum and maximum Kp values were developed by identifying the Kp values for chemicals that are structural analogs to chlorinated pyridines, such as chlorinated benzenes, methylphenols, and nitrotoluenes. The lowest and highest Kp values for these compounds were selected to represent the range of Kp values (minimum and maximum) for the chloropyridines. Minimum, average, and maximum Kp values are presented in Attachment A, Tables A-2 through A-4.

The variables which were not adjusted include the surface-water ingestion rate, exposure frequency, and exposure duration. Although modification of these exposure variables together could substantially affect the calculated RBCs, they were not adjusted due to lack of alternative data (ingestion rate) or lack of sensitivity of the parameter (exposure frequency and duration). Although the exposure frequency, like the exposure time, is an estimated value which corresponds to approximately 2 swims for each of the warmest 7 weeks of the summer, it is unlikely that swimming exposures in the canal would exceed this frequency. Even if the exposure frequency was doubled to 30 days per year, the affect on the RBC values would not be substantial when compared to the affect the range of Kp values has on the RBCs.

The RBC calculations are presented in Attachment A, Tables A-1 (average), A-5 (minimum) and A-6 (maximum), and are summarized in Table 7. As shown in Table 7, for any given risk level, the range of RBCs spans nearly two orders of magnitude. The variability in these RBCs is primarily associated with the range of Kp values; the broad range in potential Kp values for chloropyridines makes this the most sensitive variable in the exposure estimate calculations. The resulting RBCs represent ranges of indicator parameter concentrations that could potentially result in risk (at the specified levels) for the most-exposed (maximum) to least-exposed (minimum) adult swimmer.

Table 7 also includes a summary of minimum, average, and maximum canal surface water concentrations (June 1996 data). Comparison of quarry outfall water concentrations to RBCs that are based on the most stringent exposure conditions represents an extremely conservative evaluation of potential risks. Only the maximum concentrations of 2,6-dichloropyridine and 2-chloropyridine, which are represented by the data for the quarry outfall water, exceed RBCs. The RBCs exceeded are those based on maximum exposure conditions for the $1x10^{-6}$ cancer risk level; RBCs based on average exposure conditions or non-cancer effects are not exceeded.

References

ABB Environmental Services, Inc. (ABB-ES), 1996, "Remedial Investigation Report: Olin Chemicals Rochester Plant Site" May, 1996.

USEPA (1989) "Risk Assessment Guidance for Superfund: Volume I - Human Health Evaluation Manual (Part A)". U.S. Environmental Protection Agency, Office of Emergency and Remedial Response, Washington, D.C., December. EPA/540/1-89/002.

TABLE 1 | SWIM2Q96 | 18-Nov-96

INCIDENTAL INGESTION OF AND DERMAL CONTACT WITH SURFACE WATER – MAXIMUM CONCENTRATION (June 1996 Data for SWQD02)

BARGE CANAL

RECREATIONAL ADULT

OLIN CHEMICALS

ROCHESTER, NY

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS
CONCENTRATION WATER	CW	Maximum	mg/liter
INGESTION RATE	IR	0.05	liters/hour
SURFACE AREA EXPOSED	SA	19,400	cm^2
CONVERSION FACTOR	CF	0.001	$liter/cm^3$
BODY WEIGHT	BW	70	kg
EXPOSURE TIME	ET	1	hours/day
EXPOSURE FREQUENCY	EF	15	days/year
EXPOSURE DURATION	ED	30	years
EVENT FREQUENCY	EV	1	event/day
AVERAGING TIME			
CANCER	AT	70	years
NONCANCER	AT	30	years
PERMEABILITY COEFFICIENT	Kp	Chemical-specific	cm/event

Notes

For noncarcinogenic effects AT = ED

Kpevent is calculated in Attachment A, Table A-3

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR $(mg/kg-day)^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CW \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE-DERMAL} = \frac{CW \times Kp_{event} \times SA \times CF \times EF \times ED \times EV}{BW \times AT \times 365\ days/yr}$$

CARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION (mg/L)	INTAKE INGESTION (mg/kg-day)	ADJUSTED Kp (cm/event)	INTAKE DERMAL (mg/kg-day)	CANCER SLOPE FACTOR ORAL $(mg/kg-day)^{-1}$	CANCER SLOPE FACTOR DERMAL $(mg/kg-day)^{-1}$	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK	PERCENT TOTAL RISK
2,6-Dichloropyridine	0.032	4.0E-07	1.9E-02	3.0E-06	2.4E-02	2.4E-02	9.7E-09	7.1E-08	8.1E-08	32.96%
2-Chloropyridine	0.16	2.0E-06	6.2E-03	4.8E-06	2.4E-02	2.4E-02	4.8E-08	1.2E-07	1.6E-07	67.04%
						SUMMARY CANCER RISK	6E-08	2E-07	2E-07	

NONCARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION (mg/L)	INTAKE INGESTION (mg/kg-day)	ADJUSTED Kp (cm/event)	INTAKE DERMAL (mg/kg-day)	REFERENCE DOSE ORAL (mg/kg-day)	REFERENCE DOSE DERMAL (mg/kg-day)	HAZARD QUOTIENT INGESTION	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT	PERCENT TOTAL RISK
2,6-Dichloropyridine	0.16	4.7E-06	1.9E-02	3.5E-05	ND	ND				
2-Chloropyridine	0.032	9.4E-07	6.2E-03	2.3E-06	ND	ND				
3-Chloropyridine	0.011	3.2E-07	6.7E-03	8.4E-07	2.0E-02	2.0E-02	1.6E-05	4.2E-05	5.8E-05	100.00%
4-Chloropyridine	ND		5.7E-03		2.0E-02	2.0E-02				
p-Fluoroaniline	ND		4.8E-03		4.0E-03	4.0E-03				
Pyridine	ND		2.9E-03		1.0E-03	1.0E-03				
						SUMMARY HAZARD INDEX	0.00002	0.00004	0.00006	

TABLE 2
RISK-BASED CONCENTRATIONS FOR INDICATOR COMPOUNDS - SURFACE WATER
PHASE II HHRA PARAMETERS

OLIN CHEMICALS
ROCHESTER, NY

Indicator Compound	RISK BASED CONCENTRATIONS (mg/L)					
	Cancer Risk (ELCR)			Non-cancer Risk (HI)		
	$1x10^{-6}$	$1x10^{-5}$	$1x10^{-4}$	0.1	1	10
2,6-Dichloropyridine	0.4	4	40	ND	ND	ND
2-Chloropyridine	0.97	9.7	97	ND	ND	ND
3-Chloropyridine	NA	NA	NA	19	190	1900
4-Chloropyridine	NA	NA	NA	31	210	3100
p-Fluoroanaline	NA	NA	NA	2.3	48	230
Pyridine	NA	NA	NA	1.6	16	160

Risk-based concentrations were developed for an adult swimmer exposure scenario
NA = Not Applicable
ND = No Dose-Response Data
ELCR = Excess Lifetime Cancer Risk
HI = Hazard Index

TABLE 3
Pyridine Matrix Spike Blank (MSB) Recoveries
Canal Surface Water Monitoring Program

OLIN CHEMICALS
Rochester, NY

		2-Chloropyridine	3-Chloropyridine	2,6-Chloropyridine	p-Fluoroaniline
ANALYSIS	ORIGINAL CONC. UG/L	0	0	0	0
DATE	SPIKE ADDED UG/L	100	100	100	100
8/21/95	**MSB % REC.**	**52**	**69**	**41**	**14**
8/21/95	**MSB % REC.**	**68**	**95**	**72**	**12**
9/13/95	**MSB % REC.**	**97**	**82**	**59**	**23**
11/17/95	**MSB % REC.**	**43**	**51**	**43**	**40**
11/25/95	**MSB % REC.**	**54**	**61**	**62**	**28**
12/14/95	**MSB % REC.**	**64**	**58**	**64**	**95**
3/22/96	**MSB % REC.**	**78**	**71**	**86**	**54**
3/25/96	**MSB % REC.**	**72**	**17**	**71**	**3**
4/15/96	**MSB % REC.**	**80**	**50**	**74**	**28**
5/1/96	**MSB % REC.**	**93**	**77**	**89**	**11**
5/1/96	**MSB % REC.**	**59**	**46**	**55**	**7**
6/26/96	**MSB % REC.**	**48**	**40**	**81**	**26**
6/26/96	**MSB % REC.**	**96**	**77**	**98**	**17**
6/26/96	**MSB % REC.**	**83**	**78**	**81**	**16**
7/3/96	**MSB % REC.**	**92**	**120**	**52**	**26**
7/3/96	**MSB % REC.**	**92**	**110**	**54**	**26**
8/21/96	**MSB % REC.**	**73**	**97**	**79**	**67**
	MIN	**43**	**17**	**41**	**3**
	MAX	**97**	**120**	**98**	**95**
	AVERAGE	**73**	**71**	**68**	**29**

TABLE 4
Pyridine Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries
Canal Surface Water Monitoring Program

OLIN CHEMICALS
Rochester, NY

ANALYSIS DATE	CLIENT ID		2-Chloropyridine	3-Chloropyridine	2,6-Chloropyridine	p-Fluoroaniline
3/22/96	QP-2	ORIGINAL CONC. UG/L	860	45	140	0
		SPIKE ADDED UG/L	100	100	100	100
		MS % REC.	**240***	**85**	**60**	**21**
		MSD % REC.	**140***	**75**	**50**	**14**
3/25/96	SW-3	ORIGINAL CONC. UG/L	45	1	4	0
		SPIKE ADDED UG/L	100	100	100	100
		MS % REC.	**48**	**41**	**55**	**0**
		MSD % REC.	**75**	**48**	**66**	**0**
6/26/96	SW-6	ORIGINAL CONC. UG/L	1	0	0	0
		SPIKE ADDED UG/L	100	100	100	100
		MS % REC.	**56**	**53**	**41**	**4**
		MSD % REC.	**69**	**81**	**40**	**1**
7/8/96	SW-6RE	ORIGINAL CONC. UG/L	1	0	0	0
		SPIKE ADDED UG/L	170	170	170	170
		MS % REC.	**140**	**84**	**150**	**29**
		MSD % REC.	**70**	**70**	**76**	**10**
4/15/96	SW-3	ORIGINAL CONC. UG/L	39	2	5	0
		SPIKE ADDED UG/L	100	100	100	100
		MS % REC.	**71**	**48**	**78**	**17**
		MSD % REC.	**81**	**52**	**85**	**6**
11/17/95	QP-1	ORIGINAL CONC. UG/L	19	0	3	0
		SPIKE ADDED UG/L	100	100	100	100
		MS % REC.	**30**	**52**	**39**	**43**
		MSD % REC.	**39**	**49**	**44**	**43**

TABLE 4
Pyridine Matrix Spike/Matrix Spike Duplicate (MS/MSD) Recoveries
Canal Surface Water Monitoring Program

OLIN CHEMICALS
Rochester, NY

ANALYSIS DATE	CLIENT ID		2-Chloropyridine	3-Chloropyridine	2,6-Chloropyridine	p-Fluoroaniline
8/29/95	1BSXX3	ORIGINAL CONC. UG/L	0	0	0	0
		SPIKE ADDED UG/L	3400	3400	3400	3400
		MS % REC.	**82**	**82**	**70**	**41**
		MSD % REC.	**62**	**59**	**62**	**29**
9/13/95	SW-2	ORIGINAL CONC. UG/L	0	0	0	0
		SPIKE ADDED UG/L	100	100	100	100
		MS % REC.	**82**	**75**	**40**	**25**
		MSD % REC.	**93**	**81**	**44**	**20**
11/25/95	SW-3	ORIGINAL CONC. UG/L	1	0	0.2	0
		SPIKE ADDED UG/L	100	100	100	100
		MS % REC.	**65**	**53**	**64**	**16**
		MSD % REC.	**61**	**58**	**52**	**12**
12/14/95	BR-114	ORIGINAL CONC. UG/L	12	8	6	0
		SPIKE ADDED UG/L	100	100	100	100
		MS % REC.	**68**	**52**	**34**	**69**
		MSD % REC.	**48**	**44**	**36**	**55**
		MIN	**30**	**41**	**34**	**0**
		MAX	**140**	**85**	**150**	**69**
		AVERAGE	**69**	**62**	**59**	**23**

* value not included in maximum or calculation of average

TABLE 5
INGESTION OF FISH – JUNE 1996 DATA FOR BARGE CANAL, INCLUDING LOCATION SWQ1D02
ADULT RESIDENT
OLIN CHEMICALS
ROCHESTER, NY

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS	SOURCE
CONCENTRATION FISH TISSUE	CFT	chemical specific	µg/kg	Calculated
INGESTION RATE	IR	6.5	grams/day	USEPA, 1989 [a]
BODY WEIGHT	BW	70	kg	USEPA, 1989
CONVERSION FACTOR 1	CF_1	1.0E-09	kg/µg	
CONVERSION FACTOR 2	CF_2	1000	mg/gram	
EXPOSURE FREQUENCY	EF	365	days/year	USEPA, 1989
EXPOSURE DURATION	ED	30	years	USEPA, 1989
AVERAGING TIME				
CANCER	AT	70	years	USEPA, 1989
NONCANCER	AT	30	years	USEPA, 1989

* Ingestion rate is daily ingestion rate of average yearly fish consumption.

USEPA, 1989. Risk Assessment Guidance for Superfund, Part A. EPA/540/1-89/002

[a] Daily intake averaged over a year.

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR (mg/kg-day)^-1

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$INTAKE_{ing} = \frac{CFT \times IR \times CF_1 \times CF_2 \times EF \times ED}{BW \times AT \times 365\ days/year}$$

NOTES:

CFT = Surface water concentration (µg/L) x Bioconcentration factor

For noncarcinogenic effects AT = ED

TABLE 5, continued
INGESTION OF FISH - JUNE 1996 DATA FOR BARGE CANAL, INCLUDING LOCATION SWQD02
ADULT RESIDENT
OLIN CHEMICALS
ROCHESTER, NY

CARCINOGENIC EFFECTS

COMPOUND	SURFACE WATER CONCENTRATION	UNITS	BCF [1]	INTAKE INGESTION (mg/kg-day)	CANCER SLOPE FACTOR (mg/kg-day)^-1	CANCER RISK INGESTION
2,6-Dichloropyridine	7.5	µg/L	20	6.0E-06	2.4E-02	**1.4E-07**
2-Chloropyridine	20	µg/L	5	4.0E-06	2.4E-02	**9.6E-08**
				TOTAL CANCER RISK		**2E-07**

[1] Exposure point concentrations for any carcinogenic PAH compounds have been adjusted by application of USEPA Region IV Toxicity Equivalence Factors (USEPA, 1995)
[1] BCFs were obtained from the Phase II Report (ABB-ES, 1996).
ND = No data available.

TABLE 5, continued
INGESTION OF FISH – JUNE 1996 DATA FOR BARGE CANAL, INCLUDING LOCATION SWQDO2
ADULT RESIDENT
OLIN CHEMICALS
ROCHESTER, NY

FISHMAX

NONCARCINOGENIC EFFECTS

COMPOUND	SURFACE WATER CONCENTRATION	UNITS	BCF [1]	INTAKE INGESTION (mg/kg-day)	REFERENCE DOSE (mg/kg-day)	HAZARD QUOTIENT INGESTION
2,6-Dichloropyridine	7.5	µg/L	20	1.4E-05	ND	
2-Chloropyridine	20	µg/L	5	9.3E-06	ND	
3-Chloropyridine	6	µg/L	5	2.8E-06	2.0E-02	1.4E-04
4-Chloropyridine	ND		4		2.0E-02	
p-Fluoroaniline	ND		0.7		4.0E-03	
Pyridine	ND		1		1.0E-03	
				TOTAL HAZARD INDEX		1E-04

[1] BCFs were obtained from the Phase II Report (ABB-ES, 1996).

TABLE 6
SUMMARY OF EXPOSURE PARAMETER RANGES

OLIN CHEMICALS
ROCHESTER, NY

Exposure Level	Ingestion Rate	Surface Area	Body Weight	Exposure Time	Exposure Frequency	Exposure Duration	Permeability Coefficient
Minimum	0.05 L/hr	22,800 cm^2 (1)	98.3 kg (1)	0.5 hr	15 days/yr	30 yr	0.0051 cm/event (3)
Average (4)	0.05 L/hr	19,400 cm^2	70 kg	1 hr	15 days/yr	30 yr	0.0029 to 0.019 cm/event (4)
Maximum	0.05 L/hr	14,500 cm^2 (2)	45.6 kg (2)	2 hr	15 days/yr	30 yr	0.4 cm/event (5)

Notes:

(1) 95% value for adult male from "Exposure Factors Handbook" (USEPA, 1989)

(2) 5% value for adult female from "Exposure Factors Handbook" (USEPA, 1989)

(3) Value for 2,6-dinitrophenol; this is the chloropyridine structural surrogate with the lowest value published in "Dermal Exposure Assessment" (USEPA, 1992). Kpevent calculated in Attachment A, Table A-2.

(4) Values are the Reasonable Maximum Exposures used in the Phase II HHRA (ABB-ES, 1996); values for Kp differ from those presented in the Phase II HHRA because they have been adjusted for chemical-specific chemical-physical data. Kpevent calculated in Attachment A, Table A-3.

(5) Value for 1,3-dichlorobenzene; this is the chloropyridine structural surrogate with the highest value published in USEPA (1992). Kpevent calculated in Attachment A, Table A-4

TABLE 7
RISK-BASED CONCENTRATIONS FOR INDICATOR COMPOUNDS
SENSITIVITY ANALYSIS RESULTS

OLIN CHEMICALS
ROCHESTER, NY

Indicator Compound	RISK-BASED CONCENTRATION (mg/L) - CANCER RISK (ELCR)								
Risk Level:	$1x10^{-6}$			$1x10^{-5}$			$1x10^{-4}$		
Exposure:	MAX	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN
2,6-Dichloropyridine	0.026	0.4	1.6	0.26	4	16	2.6	40	160
2-Chloropyridine	0.026	0.97	1.6	0.26	9.7	16	2.6	97	160
3-Chloropyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA
4-Chloropyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA
p-Fluoroanaline	NA	NA	NA	NA	NA	NA	NA	NA	NA
Pyridine	NA	NA	NA	NA	NA	NA	NA	NA	NA

Indicator Compound	RISK-BASED CONCENTRATION (mg/L) - NON-CANCER RISK (HI)								
Risk Level:	0.1			1			10		
Exposure:	MAX	AVG	MIN	MAX	AVG	MIN	MAX	AVG	MIN
2,6-Dichloropyridine	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloropyridine	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Chloropyridine	0.53	19	34	5.3	190	340	53	1900	3400
4-Chloropyridine	0.53	21	34	5.3	210	340	53	2100	3400
p-Fluoroanaline	0.11	4.8	6.8	1.1	48	68	11	480	680
Pyridine	0.027	1.6	1.7	0.27	16	17	2.7	160	170

Indicator Compound	Erie Barge Canal Concentrations (mg/L)		
	MIN [a]	AVG [b]	MAX [c]
2,6-Dichloropyridine	0.0003	0.0075	0.032
2-Chloropyridine	0.0009	0.02	0.16
3-Chloropyridine	(0.011)	0.011	0.011

NOTES:
[a] Minimum detected concentrations (June 1996 data) in Erie Barge Canal Surface Water (3-chloropyridine was detected in outfall water only).
[b] Average concentrations (June 1996 data) in Erie Barge Canal Surface Water, including quarry outfall data (sample SWQD02)
[c] Maximum concentrations (June 1996 data), represented by quarry outfall data (sample SWQD02)
NA = Not Applicable
ND = No Dose-Response Data
ELCR = Excess Lifetime Cancer Risk
HI = Hazard Index

ATTACHMENT A

TABLE A-1

SWIM-PRG | 18-Nov-96

INCIDENTAL INGESTION OF AND DERMAL CONTACT WITH SURFACE WATER - RBC CALCULATIONS
BARGE CANAL
RECREATIONAL ADULT
OLIN CHEMICALS
ROCHESTER, NY

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS
CONCENTRATION WATER	CW	Maximum	mg/liter
INGESTION RATE	IR	0.05	liters/hour
SURFACE AREA EXPOSED	SA	19,400	cm^2
CONVERSION FACTOR	CF	0.001	$liter/cm^3$
BODY WEIGHT	BW	70	kg
EXPOSURE TIME	ET	1	hours/day
EXPOSURE FREQUENCY	EF	15	days/year
EXPOSURE DURATION	ED	30	years
EVENT FREQUENCY	EV	1	event/day
AVERAGING TIME			
CANCER	AT	70	years
NONCANCER	AT	30	years
PERMEABILITY COEFFICIENT	Kp	Chemical-specific	cm/event

Notes
For noncarcinogenic effects AT = ED
Kpevent is calculated in Attachment A, Table A-3

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR $(mg/kg-day)^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CW \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE-DERMAL} = \frac{CW \times Kp_{event} \times SA \times CF \times EF \times ED \times EV}{BW \times AT \times 365\ days/yr}$$

CARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION (mg/L)	INTAKE INGESTION (mg/kg-day)	ADJUSTED Kp (cm/event)	INTAKE DERMAL (mg/kg-day)	CANCER SLOPE FACTOR ORAL $(mg/kg-day)^{-1}$	CANCER SLOPE FACTOR DERMAL $(mg/kg-day)^{-1}$	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK	RBC (mg/L)
2,6-Dichloropyridine	1	1.3E-05	1.9E-02	9.3E-05	2.4E-02	2.4E-02	3.0E-07	2.2E-06	2.5E-06	4.0E-01
2-Chloropyridine	1	1.3E-05	6.2E-03	3.0E-05	2.4E-02	2.4E-02	3.0E-07	7.3E-07	1.0E-06	9.7E-01

NONCARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION (mg/L)	INTAKE INGESTION (mg/kg-day)	ADJUSTED Kp (cm/event)	INTAKE DERMAL (mg/kg-day)	REFERENCE DOSE ORAL (mg/kg-day)	REFERENCE DOSE DERMAL (mg/kg-day)	HAZARD QUOTIENT INGESTION	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT	RBC (mg/L)
2,6-Dichloropyridine	1	2.9E-05	1.9E-02	2.2E-04	ND	ND				
2-Chloropyridine	1	2.9E-05	6.2E-03	7.1E-05	ND	ND				
3-Chloropyridine	1	2.9E-05	6.7E-03	7.6E-05	2.0E-02	2.0E-02	1.5E-03	3.8E-03	5.3E-03	1.9E+02
4-Chloropyridine	1	2.9E-05	5.7E-03	6.5E-05	2.0E-02	2.0E-02	1.5E-03	3.2E-03	4.7E-03	2.1E+02
p-Fluoroaniline	1	2.9E-05	4.8E-03	5.5E-05	4.0E-03	4.0E-03	7.3E-03	1.4E-02	2.1E-02	4.8E+01
Pyridine	1	2.9E-05	2.9E-03	3.3E-05	1.0E-03	1.0E-03	2.9E-02	3.3E-02	6.2E-02	1.6E+01

TABLE A-2
PERMEABILITY COEFFICIENTS FOR CPCs IN SURFACE WATER
MINIMUM VALUES

OLIN CHEMICALS PHASE II RI REPORT
ROCHESTER, N.Y.

Compound	Exposure Time (ET) (hr)	log K_{ow} [1]	MW[1]	Kp [2] (cm/hr)	r [2] (hr)	t* [2] (hr)	B [2]	Kp_{event} [3] (cm/event)
INDICATOR COMPOUNDS								
2,6-Dichloropyridine	2	2.15	148	2.5E-03	1.1E+00	2.7E+00	5.2E-03	1.0E-02
2,6-Dichloropyridine	1	2.15	148	2.5E-03	1.1E+00	2.7E+00	5.2E-03	7.2E-03
2,6-Dichloropyridine	0.5	2.15	148	2.5E-03	1.1E+00	2.7E+00	5.2E-03	5.1E-03
2-Chloropyridine	2	1.33	113	2.5E-03	1.1E+00	2.7E+00	5.2E-03	1.0E-02
2-Chloropyridine	1	1.33	113	2.5E-03	1.1E+00	2.7E+00	5.2E-03	7.2E-03
2-Chloropyridine	0.5	1.33	113	2.5E-03	1.1E+00	2.7E+00	5.2E-03	5.1E-03
3-Chloropyridine	2	1.38	113	2.5E-03	1.1E+00	2.7E+00	5.2E-03	1.0E-02
3-Chloropyridine	1	1.38	113	2.5E-03	1.1E+00	2.7E+00	5.2E-03	7.2E-03
3-Chloropyridine	0.5	1.38	113	2.5E-03	1.1E+00	2.7E+00	5.2E-03	5.1E-03
4-Chloropyridine	2	1.28	113	2.5E-03	1.1E+00	2.7E+00	5.2E-03	1.0E-02
4-Chloropyridine	1	1.28	113	2.5E-03	1.1E+00	2.7E+00	5.2E-03	7.2E-03
4-Chloropyridine	0.5	1.28	113	2.5E-03	1.1E+00	2.7E+00	5.2E-03	5.1E-03
p-Fluoraniline	2	1.15	111	2.5E-03	1.1E+00	2.7E+00	5.2E-03	1.0E-02
p-Fluoraniline	1	1.15	111	2.5E-03	1.1E+00	2.7E+00	5.2E-03	7.2E-03
p-Fluoraniline	0.5	1.15	111	2.5E-03	1.1E+00	2.7E+00	5.2E-03	5.1E-03
Pyridine	2	0.67	79	2.5E-03	1.1E+00	2.7E+00	5.2E-03	1.0E-02
Pyridine	1	0.67	79	2.5E-03	1.1E+00	2.7E+00	5.2E-03	7.2E-03
Pyridine	0.5	0.67	79	2.5E-03	1.1E+00	2.7E+00	5.2E-03	5.1E-03

Notes:

[1] These values were obtained from the Phase II ERA.

[2] Values for 2,6-Dinitrotoluene from USEPA, 1992:

[3] Kp (adjusted) estimates calculated as follows:

If ET < t*, then:

$$Kp_{event}\ (cm/event) = 2 \times Kp \times [(6 \times r \times ET) / \pi]^{0.5}$$

If ET > t*, then:

$$Kp_{event}\ (cm/event) = Kp \times [(ET/1 + B) + 2 \times r \times ((1 + 3B)/1 + B)]$$

Acronyms:
hr = hour
cm = centimeter
Kp = Permeability Coefficient
K_{ow} = Octanol/water partitioning coefficient
MW = molecular weight
r = lag time
t* = time to reach steady state
B = partitioning factor
ND = no data
NA = not applicable
BHC = Benzenehexachloride

Sources:

USEPA, 1992b. Dermal Exposure Assesment: Principles and Applications. Interim Report. EPA/600/8-91/011B
USEPA, 1993a. Superfund Chemical Data Matrix. March.

TABLE A-3
PERMEABILITY COEFFICIENTS FOR CPCs IN SURFACE WATER
AVERAGE VALUES

OLIN CHEMICALS PHASE II RI REPORT
ROCHESTER, N.Y.

Compound	Exposure Time (ET) (hr)	log K_{ow} [1]	MW[1]	Kp [2] (cm/hr)	r [2] (hr)	t* [2] (hr)	B [2]	Kp_{event} [3] (cm/event)
INDICATOR COMPOUNDS								
2,6-Dichloropyridine	2	2.15	148	8.0E-03	7.0E-01	1.7E+00	1.4E-02	2.8E-02
2,6-Dichloropyridine	1	2.15	148	8.0E-03	7.0E-01	1.7E+00	1.4E-02	1.9E-02
2,6-Dichloropyridine	0.5	2.15	148	8.0E-03	7.0E-01	1.7E+00	1.4E-02	1.3E-02
2-Chloropyridine	2	1.33	113	3.4E-03	4.3E-01	1.0E+00	2.1E-03	9.8E-03
2-Chloropyridine	1	1.33	113	3.4E-03	4.3E-01	1.0E+00	2.1E-03	6.2E-03
2-Chloropyridine	0.5	1.33	113	3.4E-03	4.3E-01	1.0E+00	2.1E-03	4.4E-03
3-Chloropyridine	2	1.38	113	3.7E-03	4.3E-01	1.0E+00	2.4E-03	1.1E-02
3-Chloropyridine	1	1.38	113	3.7E-03	4.3E-01	1.0E+00	2.4E-03	6.7E-03
3-Chloropyridine	0.5	1.38	113	3.7E-03	4.3E-01	1.0E+00	2.4E-03	4.8E-03
4-Chloropyridine	2	1.28	113	3.2E-03	4.3E-01	1.0E+00	1.9E-03	9.0E-03
4-Chloropyridine	1	1.28	113	3.2E-03	4.3E-01	1.0E+00	1.9E-03	5.7E-03
4-Chloropyridine	0.5	1.28	113	3.2E-03	4.3E-01	1.0E+00	1.9E-03	4.0E-03
p-Fluoraniline	2	1.15	111	2.6E-03	4.2E-01	1.0E+00	1.4E-03	7.4E-03
p-Fluoraniline	1	1.15	111	2.6E-03	4.2E-01	1.0E+00	1.4E-03	4.8E-03
p-Fluoraniline	0.5	1.15	111	2.6E-03	4.2E-01	1.0E+00	1.4E-03	3.3E-03
Pyridine	2	0.67	79	1.9E-03	2.7E-01	6.4E-01	4.7E-04	4.8E-03
Pyridine	1	0.67	79	1.9E-03	2.7E-01	6.4E-01	4.7E-04	2.9E-03
Pyridine	0.5	0.67	79	1.9E-03	2.7E-01	6.4E-01	4.7E-04	1.9E-03

Notes:

[1] These values were obtained from the Phase II ERA.

[2] Values calculated as follows:

1. $\text{Log } Kp = -2.72 + 0.71 \times \log K_{ow} - 0.0061 \times MW$
2. $B = K_{ow} / 10^4$
3. $r = l_{sc}^2 / (6 \times (l_{sc} \times 10^{(-2.72 - 0.0061 \times MW)}))$
   where $l_{sc} = 10\,\mu m = 0.001$ cm
4. If $B \leq 0.1$, then $t^* = 2.4 \times r$
   If $0.1 \leq B \leq 1.17$, then $t^* = (8.4 + 6 \log B) \times r$
   If $B \geq 1.17$, then $t^* = 6 \times (b - (b^2 - c^2)^{0.5}) \times r$
   where $b = (2/\pi) \times (1 + B)^2 - c$
   and $c = (1 + 3B) / 3$

[3] Kp (adjusted) estimated values calculated as follows:

If $ET < t^*$, then:

Kp_{event} (cm/event) $= 2 \times Kp \times [(6 \times r \times ET) / \pi]^{0.5}$

If $ET > t^*$, then:

Kp_{event} (cm/event) $= Kp \times [(ET/1 + B) + 2 \times r \times ((1 + 3B)/1 + B)]$

Acronyms:
hr = hour
cm = centimeter
Kp = Permeability Coefficient
K_{ow} = Octanol/water partitioning coefficient
MW = molecular weight
r = lag time
t^* = time to reach steady state
B = partitioning factor
ND = no data
NA = not applicable
BHC = Benzenehexachloride

Sources:

USEPA. 1992b. Dermal Exposure Assesment: Principles and Applications. Interim Report. EPA/600/8-91/011B
USEPA. 1993a. Superfund Chemical Data Matrix. March.

TABLE A-4
PERMEABILITY COEFFICIENTS FOR CPCs IN SURFACE WATER
MAXIMUM VALUES

OLIN CHEMICALS PHASE II RI REPORT
ROCHESTER, N.Y.

Compound	Exposure Time (ET) (hr)	log K_{ow} [1]	MW[1]	Kp [2] (cm/hr)	r [2] (hr)	t* [2] (hr)	B [2]	Kp_{event} [3] (cm/event)
INDICATOR COMPOUNDS								
2,6-Dichloropyridine	2	2.15	148	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.8E-01
2,6-Dichloropyridine	1	2.15	148	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.0E-01
2,6-Dichloropyridine	0.5	2.15	148	8.7E-02	6.9E-01	4.1E+00	4.0E-01	1.4E-01
2-Chloropyridine	2	1.33	113	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.8E-01
2-Chloropyridine	1	1.33	113	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.0E-01
2-Chloropyridine	0.5	1.33	113	8.7E-02	6.9E-01	4.1E+00	4.0E-01	1.4E-01
3-Chloropyridine	2	1.38	113	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.8E-01
3-Chloropyridine	1	1.38	113	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.0E-01
3-Chloropyridine	0.5	1.38	113	8.7E-02	6.9E-01	4.1E+00	4.0E-01	1.4E-01
4-Chloropyridine	2	1.28	113	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.8E-01
4-Chloropyridine	1	1.28	113	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.0E-01
4-Chloropyridine	0.5	1.28	113	8.7E-02	6.9E-01	4.1E+00	4.0E-01	1.4E-01
p-Fluoraniline	2	1.15	111	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.8E-01
p-Fluoraniline	1	1.15	111	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.0E-01
p-Fluoraniline	0.5	1.15	111	8.7E-02	6.9E-01	4.1E+00	4.0E-01	1.4E-01
Pyridine	2	0.67	79	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.8E-01
Pyridine	1	0.67	79	8.7E-02	6.9E-01	4.1E+00	4.0E-01	2.0E-01
Pyridine	0.5	0.67	79	8.7E-02	6.9E-01	4.1E+00	4.0E-01	1.4E-01

Notes:

[1] These values were obtained from the Phase II ERA.

[2] Values for 1,3-Dichlorobenzene from USEPA, 1992:

[3] Kp (adjusted) estimates calculated as follows:

If ET < t*, then;

$$Kp_{event}\,(cm/event) = 2 \times Kp \times [(6 \times r \times ET) / \pi]^{0.5}$$

If ET > t*, then;

$$Kp_{event}\,(cm/event) = Kp \times [(ET/1 + B) + 2 \times r \times ((1 + 3B)/1 + B)]$$

Acronyms:
hr = hour
cm = centimeter
Kp = Permeability Coefficient
K_{ow} = Octanol/water partitioning coefficient
MW = molecular weight
r = lag time
t* = time to reach steady state
B = partitioning factor
ND = no data
NA = not applicable
BHC = Benzenehexachloride

Sources:

USEPA, 1992b. Dermal Exposure Assesment: Principles and Applications. Interim Report. EPA/600/8-91/011B
USEPA, 1993a. Superfund Chemical Data Matrix. March.

TABLE A-5

SWMPRGMN | 18-Nov-98

INCIDENTAL INGESTION OF AND DERMAL CONTACT WITH SURFACE WATER - MINIMUM EXPOSURE RBC CALCULATIONS
BARGE CANAL
RECREATIONAL ADULT
OLIN CHEMICALS
ROCHESTER, NY

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS
CONCENTRATION WATER	CW	Maximum	mg/liter
INGESTION RATE	IR	0.05	liters/hour
SURFACE AREA EXPOSED	SA	22,800	cm^2
CONVERSION FACTOR	CF	0.001	$liter/cm^3$
BODY WEIGHT	BW	98.3	kg
EXPOSURE TIME	ET	0.5	hours/day
EXPOSURE FREQUENCY	EF	15	days/year
EXPOSURE DURATION	ED	30	years
EVENT FREQUENCY	EV	1	event/day
AVERAGING TIME			
CANCER	AT	70	years
NONCANCER	AT	30	years
PERMEABILITY COEFFICIENT	Kp	Chemical-specific	cm/event

Notes
For noncarcinogenic effects: AT = ED
Kp_{event} is calculated in Attachment A, Table A-2

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR $(mg/kg-day)^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CW \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE-DERMAL} = \frac{CW \times Kp_{event} \times SA \times CF \times EF \times ED \times EV}{BW \times AT \times 365\ days/yr}$$

CARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION (mg/L)	INTAKE INGESTION (mg/kg-day)	ADJUSTED Kp (cm/event)	INTAKE DERMAL (mg/kg-day)	CANCER SLOPE FACTOR ORAL $(mg/kg-day)^{-1}$	CANCER SLOPE FACTOR DERMAL $(mg/kg-day)^{-1}$	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK	RBC (mg/L)
2,6-Dichloropyridine	1	4.5E-06	5.1E-03	2.1E-05	2.4E-02	2.4E-02	1.1E-07	5.0E-07	6.1E-07	1.6E+00
2-Chloropyridine	1	4.5E-06	5.1E-03	2.1E-05	2.4E-02	2.4E-02	1.1E-07	5.0E-07	6.1E-07	1.6E+00

NONCARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION (mg/L)	INTAKE INGESTION (mg/kg-day)	ADJUSTED Kp (cm/event)	INTAKE DERMAL (mg/kg-day)	REFERENCE DOSE ORAL (mg/kg-day)	REFERENCE DOSE DERMAL (mg/kg-day)	HAZARD QUOTIENT INGESTION	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT	RBC (mg/L)
2,6-Dichloropyridine	1	1.0E-05	5.1E-03	4.9E-05	ND	ND				
2-Chloropyridine	1	1.0E-05	5.1E-03	4.9E-05	ND	ND				
3-Chloropyridine	1	1.0E-05	5.1E-03	4.9E-05	2.0E-02	2.0E-02	5.2E-04	2.4E-03	3.0E-03	3.4E+02
4-Chloropyridine	1	1.0E-05	5.1E-03	4.9E-05	2.0E-02	2.0E-02	5.2E-04	2.4E-03	3.0E-03	3.4E+02
p-Fluoroaniline	1	1.0E-05	5.1E-03	4.9E-05	4.0E-03	4.0E-03	2.6E-03	1.2E-02	1.5E-02	6.8E+01
Pyridine	1	1.0E-05	5.1E-03	4.9E-05	1.0E-03	1.0E-03	1.0E-02	4.9E-02	5.9E-02	1.7E+01

TABLE A-6

SWMPRGMX | 18-Nov-96

INCIDENTAL INGESTION OF AND DERMAL CONTACT WITH SURFACE WATER - MAXIMUM EXPOSURE RBC CALCULATIONS
BARGE CANAL
RECREATIONAL ADULT
OLIN CHEMICALS
ROCHESTER, NY

EXPOSURE PARAMETERS

PARAMETER	SYMBOL	VALUE	UNITS
CONCENTRATION WATER	CW	Maximum	mg/liter
INGESTION RATE	IR	0 05	liters/hour
SURFACE AREA EXPOSED	SA	14,500	cm^2
CONVERSION FACTOR	CF	0.001	$liter/cm^3$
BODY WEIGHT	BW	45 6	kg
EXPOSURE TIME	ET	2	hours/day
EXPOSURE FREQUENCY	EF	15	days/year
EXPOSURE DURATION	ED	30	years
EVENT FREQUENCY	EV	1	event/day
AVERAGING TIME			
CANCER	AT	70	years
NONCANCER	AT	30	years
PERMEABILITY COEFFICIENT	Kp	Chemical-specific	cm/event

Notes
For noncarcinogenic effects AT = ED
Kpevent is calculated in Appendix A, Table A-4

EQUATIONS

CANCER RISK = INTAKE (mg/kg-day) x CANCER SLOPE FACTOR $(mg/kg-day)^{-1}$

HAZARD QUOTIENT = INTAKE (mg/kg-day) / REFERENCE DOSE (mg/kg-day)

$$\text{INTAKE-INGESTION} = \frac{CW \times IR \times ET \times EF \times ED}{BW \times AT \times 365\ days/yr}$$

$$\text{INTAKE-DERMAL} = \frac{CW \times Kp_{event} \times SA \times CF \times EF \times ED \times EV}{BW \times AT \times 365\ days/yr}$$

CARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION (mg/L)	INTAKE INGESTION (mg/kg-day)	ADJUSTED Kp (cm/event)	INTAKE DERMAL (mg/kg-day)	CANCER SLOPE FACTOR ORAL $(mg/kg-day)^{-1}$	CANCER SLOPE FACTOR DERMAL $(mg/kg-day)^{-1}$	CANCER RISK INGESTION	CANCER RISK DERMAL	TOTAL CANCER RISK	RBC (mg/L)
2,6-Dichloropyridine	1	3.9E-05	2 8E-01	1.6E-03	2.4E-02	2.4E-02	9 3E-07	3 8E-05	3 9E-05	2 6E-02
2-Chloropyridine	1	3 9E-05	2 8E-01	1.6E-03	2 4E-02	2.4E-02	9 3E-07	3 8E-05	3 9E-05	2 6E-02

NONCARCINOGENIC EFFECTS

COMPOUND	WATER CONCENTRATION (mg/L)	INTAKE INGESTION (mg/kg-day)	ADJUSTED Kp (cm/event)	INTAKE DERMAL (mg/kg-day)	REFERENCE DOSE ORAL (mg/kg-day)	REFERENCE DOSE DERMAL (mg/kg-day)	HAZARD QUOTIENT INGESTION	HAZARD QUOTIENT DERMAL	TOTAL HAZARD QUOTIENT	RBC (mg/L)
2,6-Dichloropyridine	1	9.0E-05	2 8E-01	3.7E-03	ND	ND				
2-Chloropyridine	1	9 0E-05	2 8E-01	3.7E-03	ND	ND				
3-Chloropyridine	1	9 0E-05	2 8E-01	3.7E-03	2 0E-02	2 0E-02	4 5E-03	1 8E-01	1 9E-01	5 3E+00
4-Chloropyridine	1	9.0E-05	2 8E-01	3 7E-03	2 0E-02	2 0E-02	4 5E-03	1 8E-01	1 9E-01	5 3E+00
p-Fluoroaniline	1	9 0E-05	2 8E-01	3 7E-03	4 0E-03	4 0E-03	2 3E-02	9 1E-01	9 4E-01	1 1E+00
Pyridine	1	9.0E-05	2 8E-01	3 7E-03	1 0E-03	1.0E-03	9 0E-02	3 7E+00	3 7E+00	2 7E-01

ATTACHMENT B

ATTACHMENT B-1 - MEMORANDUM REGARDING QC LIMITS
ATTACHMENT B-2 - PAGE 21 OF SEPTEMBER 1996 CANAL SAMPLING LABORATORY REPORT OF RESULTS

MEMORANDUM

TO: James Stadelmaier / Program Manager
FROM: Verl Preston / QA-QC Manager
DATE: October 24, 1996

RE: Chloropyridine Quality Control Limits

Recra Environmental, Inc. routinely performs analysis for 2-Chloropyridine, 3-Chloropyridine, 2,6-Dichloropyridine and p-Fluoroaniline on samples generated from the Olin Chemicals, Rochester, NY site. In March of this year, spike recovery information from analyses performed in 1995 for these compounds was compiled and laboratory quality control limits were established. Recra generally does not perform analysis of these compounds for other than the Olin site, therefore the established quality control limits are not only laboratory specific, but are specific to the sample matrix of the Olin Rochester site.

To establish the QC limits, Recra compiled the sample specific matrix spike and matrix spike duplicate recoveries for each of the compounds for each analysis performed in 1995 at the Olin site. The mean recovery was calculated from these points and any point which fell below 1/2 of the mean or above twice the mean were discarded. The mean of the remaining points was then calculated along with the standard deviation, and the QC limits were established at the mean $\pm$ 3SD.

It should be noted that because the QC limits were based upon sample specific information rather than blank spike information, the recoveries are affected by other matrix related interferences present in the samples. The range of recoveries for each of the compounds from the 1995 analyses used in the determination are summarized below:

2-Chloropyridine	30 - 126 %
3-Chloropyridine	30 - 81 %
2,6-Dichloropyridine	39 - 93 %
p-Fluoroaniline	10 - 44 %

The large range of recoveries resulted in a large standard deviation which when multiplied by a factor of three provided a wide range for the QC acceptance limits.

ABB ENVIRONMENTAL SERVICES INC
ABB ENV SERVICES - OLIN ROCHESTER PHASE II RI/FS
ASP91-2 - SEMIVOLATILES
WATER MATRIX SPIKE/MATRIX SPIKE DUPLICATE RECOVERY

000021

Lab Name: Recra LabNet Contract: _____ Lab Samp ID: A6473003

Lab Code: RECNY Case No.: 5762 SAS No.: _____ SDG No.: SW1

Matrix Spike - Client Sample No.: SW-3

COMPOUND	SPIKE ADDED UG/L	SAMPLE CONCENTRATION UG/L	MS CONCENTRATION UG/L	MS % REC #	QC LIMITS REC.
2-Chloropyridine	100	0	91	91	10 - 128
3-Chloropyridine	100	0	90	90	10 - 103
2,6-Dichloropyridine	100	0	88	88	10 - 120
p-Fluoroaniline	100	0	2	2 *	10 - 95

COMPOUND	SPIKE ADDED UG/L	MSD CONCENTRATION UG/L	MSD % REC #	% RPD #	QC LIMITS RPD	QC LIMITS REC.
2-Chloropyridine	100	68	68	29	30	10 - 128
3-Chloropyridine	100	74	74	20	30	10 - 103
2,6-Dichloropyridine	100	77	77	13	30	10 - 120
p-Fluoroaniline	100	2	2 *	0	30	10 - 95

Column to be used to flag recovery and RPD values with an asterisk

* Values outside of QC limits

RPD: 0 out of 4 outside limits
Spike recovery: 2 out of 8 outside limits

Comments: _____

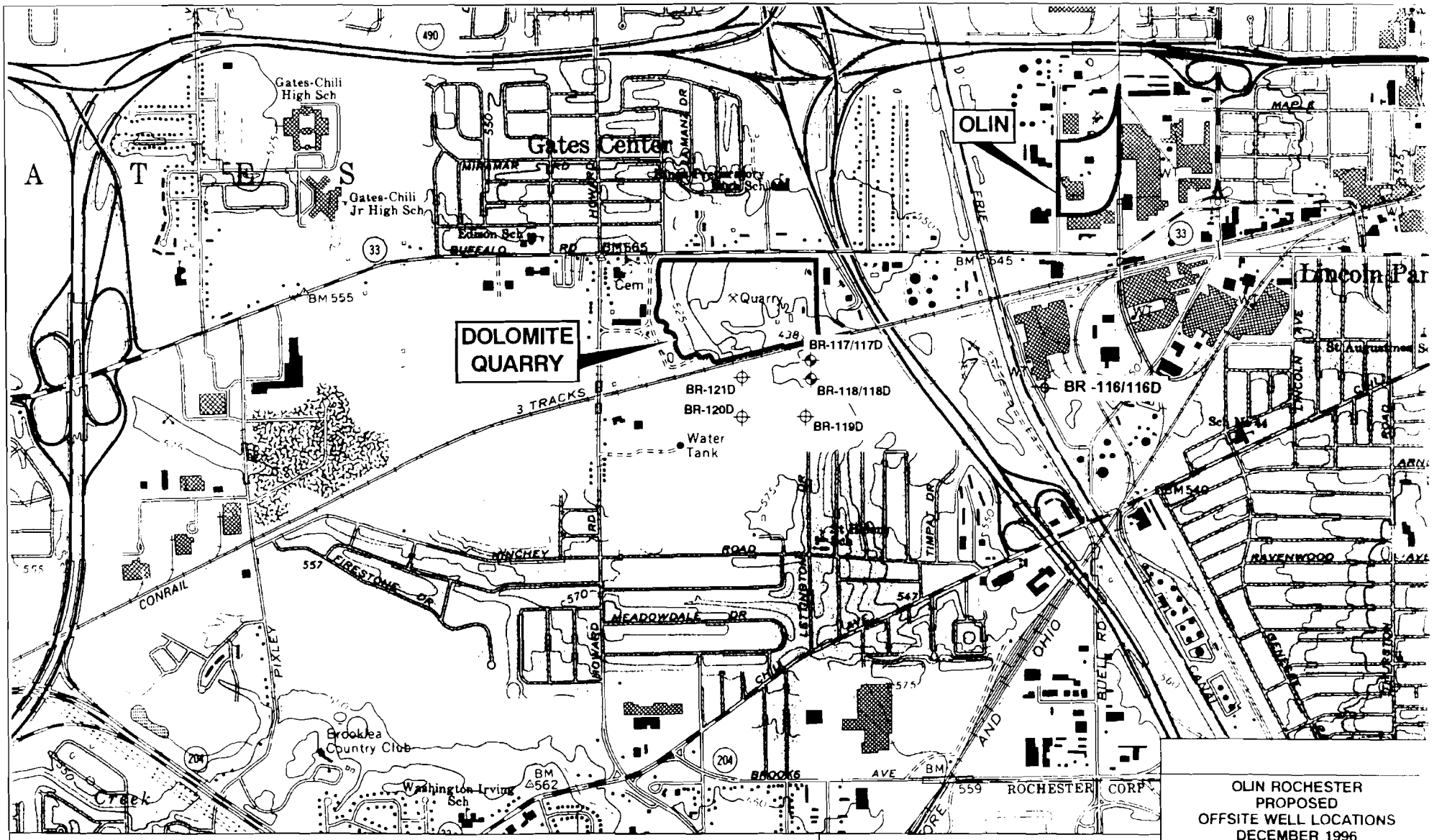
Olin Chemicals
Rochester, NY
November 1996 Sampling Event

Selected Pyridine Analysis (ug/L)

Validated Data Table

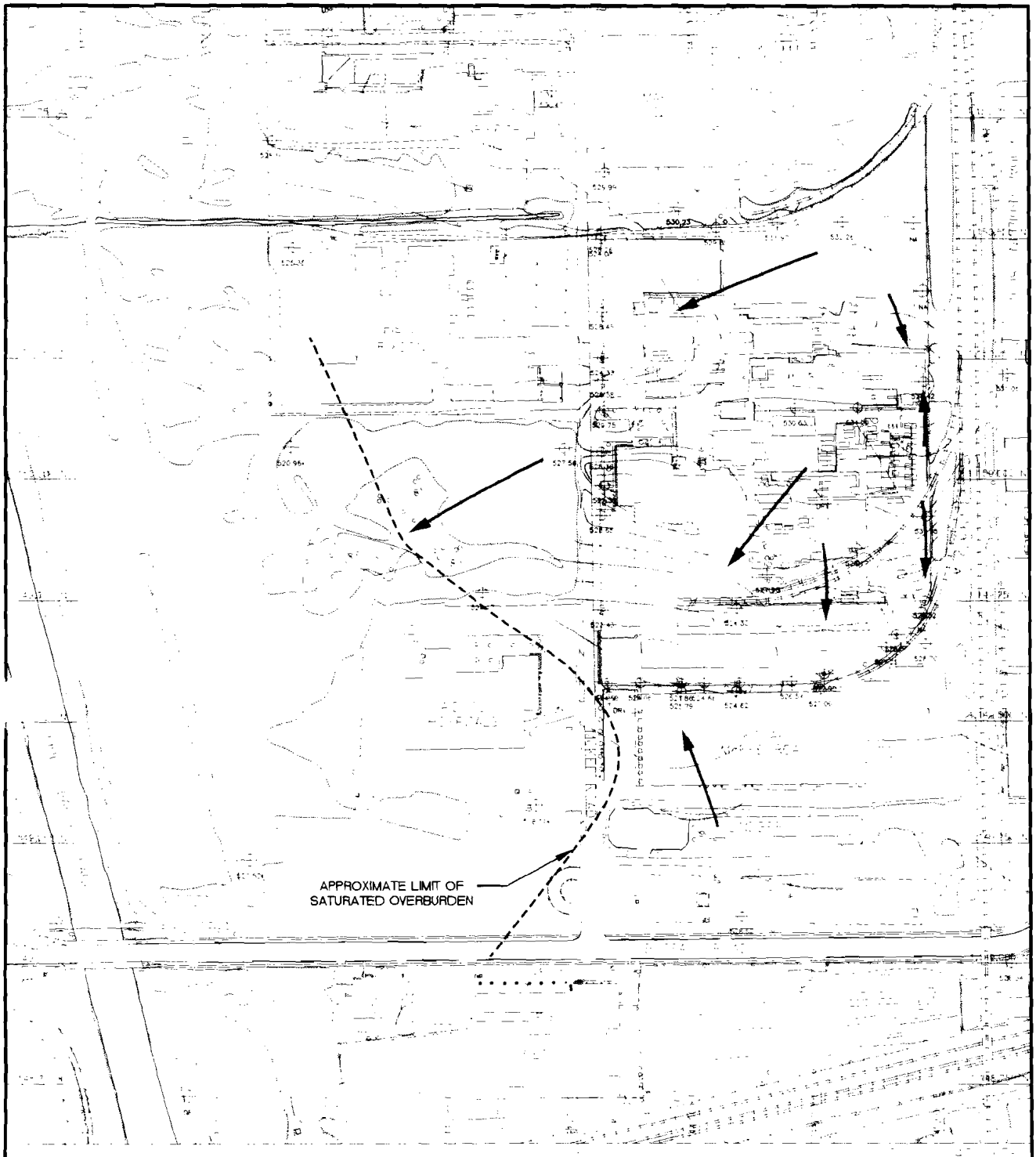
LOCATION		MW-117	MW-117D	MW-118	MW-118D	MW-117D DUP
LAB ID		A6543801	A6543802	A6543803	A6543804	A6543805
DATE SAMPLED		11/7/96	11/7/96	11/7/96	11/7/96	11/7/96
DATE EXTRACTED		11/12/96	11/12/96	11/12/96	11/12/96	11/12/96
DATE ANALYZED		11/21/96	11/21/96	11/21/96	11/21/96	11/21/96
SAMPLE TYPE		FS	FS	FS	FS	FD*
PARAMETER	RL					
2,6-Dichloropyridine	10	6 J	0.7 J	10 U	2 J	0.6 J
2-Chloropyridine	10	7 J	34	5 J	120 D	29
3-Chloropyridine	10	10 U	0.5 J	10 U	1 J	0.4 J
4-Chloropyridine	10	10 U	10 U	10 U	10 U	11 U
p-Fluoroaniline	10	10 U	10 U	10 U	10 U	11 U
Pyridine	10	10 U	10 U	10 U	0.7 J	11 U
DF		1	1	1	1	1
ANALYSIS		ASP91	ASP91	ASP91	ASP91	ASP91

* = well labled MW-A on Chain of Custody Record
ASP91 = 1991 New York State Analytical Services Protocol
J = estimated value below reporting limit, but greater than zero
D = value obtained from a secondary dilution

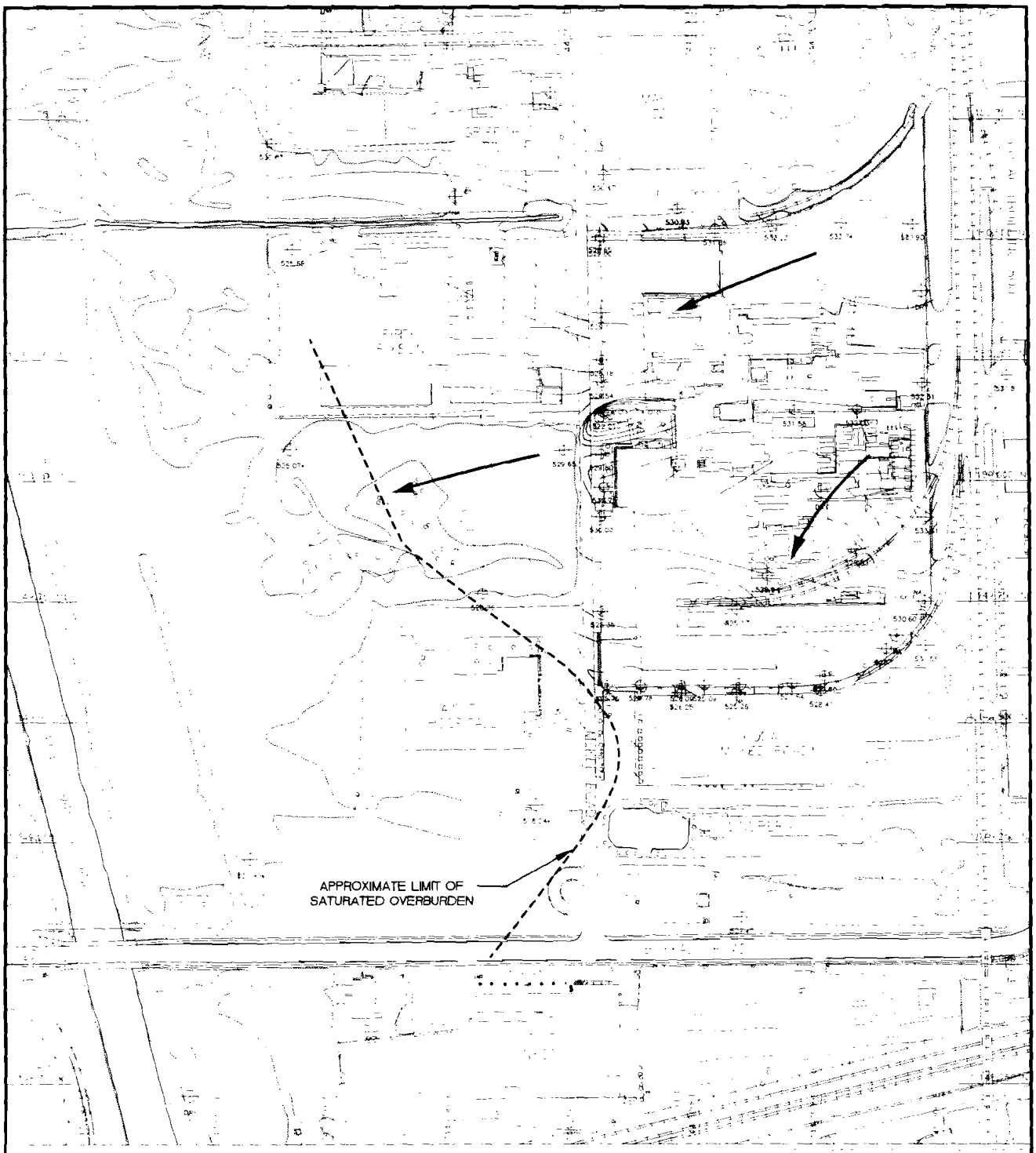

DOLOMITE QUARRY
OLIN
Gates Center
Gates-Chili High Sch
Gates-Chili Jr High Sch
Lincoln Par
BR-117/117D
BR-121D
BR-120D
BR-118/118D
BR-119D
BR -116/116D
Water Tank
3 TRACKS
CONRAIL
FIRESTONE DR
MEADOWDALE DR
BROOKS AVE
Brooklea Country Club
Washington Irving Sch
Edison Sch
Cem
Quarry
BM 555
BM 565
BM 545
BM 540
BM △562
ROCHESTER CORP
OHIO AND ERIE CANAL
SCALE IN FEET
0
1200
2400
N
Base Map Source: USGS Quadrangle of Rochester West, N.Y., 7.5 Minute Series, Dated Photorevised 1978. Enlarged for detail 167% by ABB-ES.
LEGEND
EXISTING MONITORING WELL PAIR
PROPOSED MONITORING WELL
OLIN ROCHESTER
PROPOSED
OFFSITE WELL LOCATIONS
DECEMBER 1996
Rochester, New York

W961200 6D

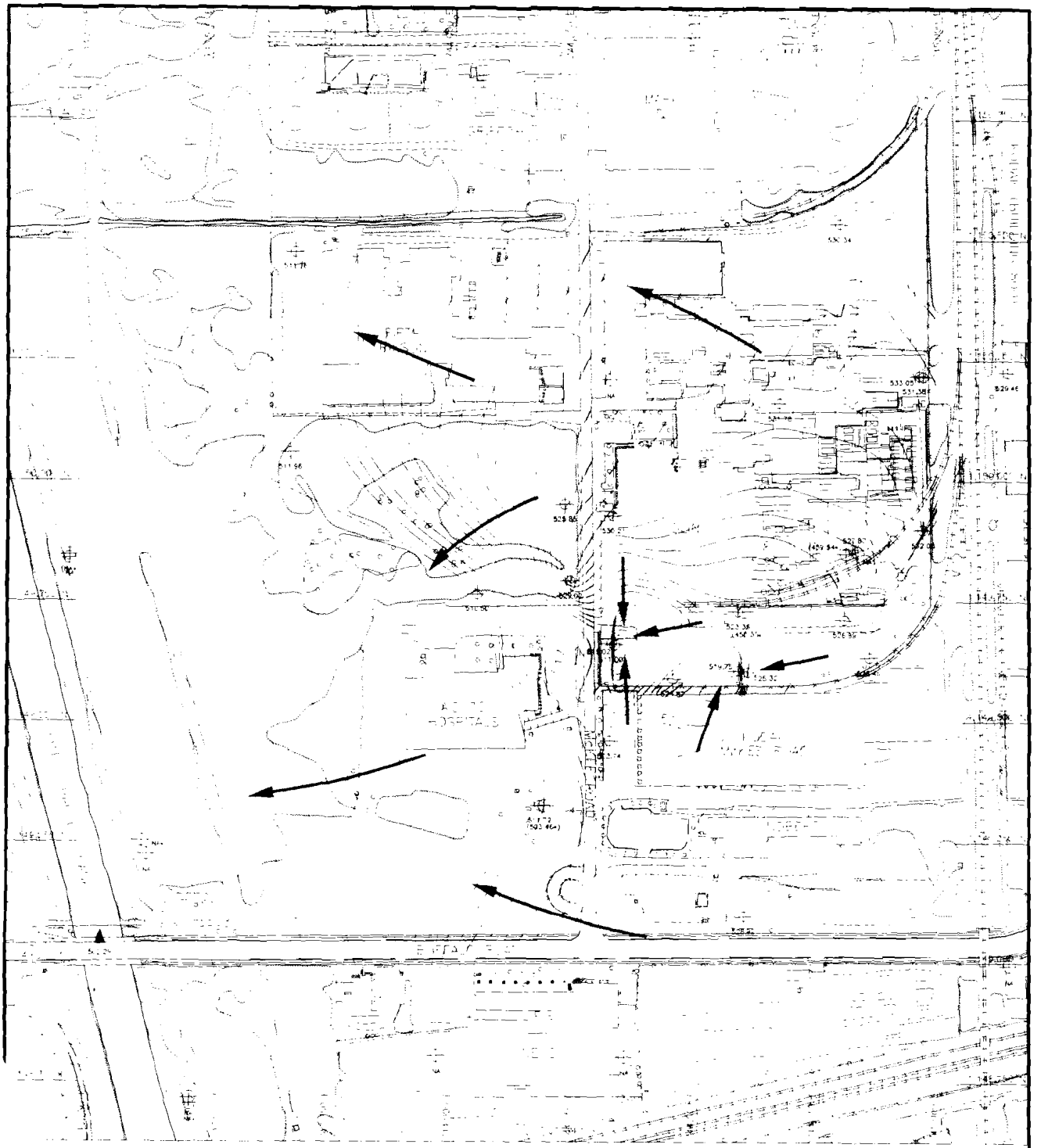
SEPTEMBER 1996
BEDROCK GROUNDWATER
INTERPRETED PIEZOMETRIC
CONTOURS



SEPTEMBER 1996
OVERBURDEN GROUNDWATER
INTERPRETED PIEZOMETRIC
CONTOURS



DECEMBER 1996
OVERBURDEN GROUNDWATER
INTERPRETED PIEZOMETRIC
CONTOURS



DECEMBER 1996
BEDROCK GROUNDWATER
INTERPRETED PIEZOMETRIC
CONTOURS